Michael Plasmeier

Review Worksheet

5/2

Simplify

1. a. $\cos(75^\circ)\cos(15^\circ) + \sin(75^\circ)\sin(15^\circ)$

$\cos(15 - 75)$

$\cos(-60)$

$\cos(60^\circ) \rightarrow \frac{1}{2}$

b. $\sin(75^\circ)\cos(15^\circ) + \cos(75^\circ)\sin(15^\circ)$

$\sin(75 + 15)$

$\sin(90)^\circ \rightarrow 1$

c. $\cos(30^\circ + x) + \cos(30 - x)$

$\cos(30)\cos(x) - \sin 30 \sin x + \cos(30^\circ)\cos(x) + \sin 30 \sin(x)$

$2\cos(30)\cos(x)$

$\frac{2}{1} \quad \frac{\sqrt{3}}{2} \quad \cos x$

$\sqrt{3}\cos x$

forth:

Remember: cross off

2. Find exact value $\cos 15^\circ$

$15^\circ = \frac{1}{2} 30^\circ$

$\cos\frac{\theta}{2} = \sqrt{\frac{1 + \cos\theta}{2}}$

$\sqrt{\frac{1 + \frac{\sqrt{3}}{2}}{2}} \rightarrow \sqrt{\frac{\frac{2+\sqrt{3}}{2}}{2}} \cdot \frac{1}{2} = \sqrt{\frac{2+\sqrt{3}}{4}}$

$\frac{\sqrt{2+\sqrt{3}}}{\sqrt{4}} = \frac{\sqrt{2+\sqrt{3}}}{2}$

4. If $\tan a = \frac{4}{3}$ and $\tan B = -\frac{1}{2}$ show that $\tan(a+b) = \tan(\pi - b)$

$\tan(a+b)$

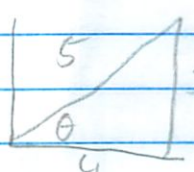
Use sum + diff formula!

$\frac{\tan a + \tan b}{1 - \tan a \tan b} \rightarrow \frac{\frac{4}{3} + -\frac{1}{2}}{1 - \left(\frac{4}{3}\right)\left(-\frac{1}{2}\right)} \rightarrow \frac{\frac{8}{6} - \frac{3}{6}}{1 - \left(-\frac{4}{6}\right)}$

$\frac{\frac{5}{6}}{1 + \frac{4}{6}} \rightarrow \frac{\frac{5}{6}}{\frac{10}{6}} \rightarrow \frac{5}{6} \cdot \frac{6}{10} \rightarrow \frac{5}{10} \rightarrow \frac{1}{2}$ ✓

$\frac{\tan \pi - \tan B}{1 + \tan \pi \tan B} \quad \frac{0 - \left(-\frac{1}{2}\right)}{1 + (0)\left(-\frac{1}{2}\right)} \quad \frac{\frac{1}{2}}{1} \rightarrow \frac{1}{2} \cdot \frac{1}{1} = \frac{1}{2}$

6. Suppose $\angle A$ is acute and $\cos A = \frac{4}{5}$ Find:



duh 3-4-5 Triangle

$5^2 = x^2 + 4^2$

$-16 \quad -16$

$9 = x^2$

$3 = x$

a) $\sin a = \frac{3}{5}$

b) $\cos 2a = 2\cos^2 a - 1$

$2\left(\frac{4}{5}\right)^2 - 1$

$2\left(\frac{16}{25}\right) - 1$

$\frac{32}{25} - \frac{25}{25}$

$\frac{7}{25}$

c) $\sin 2A = 2 \sin a \cos a$

$2\left(\frac{3}{5}\right)\left(\frac{4}{5}\right)$

$\frac{2}{1} \cdot \frac{12}{25}$

$\frac{24}{25}$

Simplify

7a. $\frac{\sin 2x}{1-\cos 2x}$

$\frac{2\sin x\cos x}{1-(1-2\sin^2 x)}$

$\frac{2\sin x\cos x}{1-1+2\sin^2 x}$

$\frac{2\sin x\cos x}{2\sin^2 x}$

$\frac{\cos x}{\sin x}$

$\cot x$

Evaluate

8a. $2\cos^2\frac{\pi}{12}-1$

$\cos 2\left(\frac{\pi}{12}\right)$

$\cos\frac{\pi}{6}$

$\frac{\sqrt{3}}{2}$

Test Review 1

Simp

$\frac{x^2+6x+9}{x^2-9}$

$\frac{(x+3)(x+3)}{(x+3)(x-3)}$

$\frac{x^2-3x+2}{x^2+3x-6}$

$\frac{(x-2)(x-1)}{(x-1)(x+6)}$

$\frac{x-2}{x+6}$

X + simp

$\frac{3x^3}{x^3y} \cdot \frac{y}{6x^4}$

$\frac{3x^4y}{6x^4y^3}$

$\frac{1}{2x^3}$

$\frac{120x^5}{4} \cdot \frac{xy}{5x^3}$

$\frac{120x^6y}{5x^3y^4}$

$\frac{24x^3}{y^3}$

Took care of that

$\frac{16x^3}{5y^9} \cdot \frac{x^3y^4}{80xy^2}$

$\frac{16x^6y^4}{400y^{11}x}$

$\frac{x^5}{25y^7}$

$9x^2 - 81 = 0$

$+81 \quad +81$

$\frac{9x^2}{9} = \frac{81}{9}$

$x^2 = 9$

$\sqrt{x^2} = \sqrt{9}$

$x = \pm 3$

check Ex: 2ans

$x = 3$

$\frac{6x^2+3}{x-1}$ Erase → $x = 1$

$3x^2 - 12 = 0$

$+12 \quad +12$

$\frac{3x^2}{3} = \frac{12}{3}$

$x^2 = 4$

$\sqrt{x^2} = \sqrt{4}$

$x = 2$

$x = -2$ } both!

$\frac{x-3}{2x-8} \cdot \frac{6x^2-96}{x^2-9}$

$\frac{(x-3)(6x+4)(x-4)}{2(x+4)(x-4)(x+3)(x-3)}$ GCF 1st

$\frac{6(x+4)}{2(x+3)}$

$\frac{3(x+4)}{x+3}$

$$\frac{x^2+6x-7}{x^4+8x^3+7x^2} \cdot \frac{3x^2}{1}$$

$$\frac{(x-1)(x+7)}{x^2(x^2+8x+7)} \cdot 3x^2$$

GCF

$$\frac{(3x^2)(x-1)(x+7)}{x^2(x+1)(x+7)}$$

$$\frac{3(x-1)}{(x+1)}$$ ✓

$$\frac{x^2+8x+16}{1} \cdot \frac{16x^2-64}{x^2-16}$$

$$\frac{(x+4)(x+4)}{1} \cdot \frac{16(x^2-4)}{(x+4)(x-4)}$$ GCF

$$\frac{(x+4)\,16(x+2)(x-2)}{x-4}$$

keep

$$\frac{16(x+4)(x^2-4)}{x-4}$$

$$\frac{x^2-7x-30}{x^2+x} \cdot \frac{x^2+x}{x+3}$$

$$\frac{(x-10)(x+3)}{x+3}$$

$x-10$ ✓

$$\frac{x^2-49}{2x^2-14x} \cdot \frac{x^2+8x+15}{x^2+4x-21}$$

GCF

$$\frac{(x+7)(x-7)}{2(x^2-7x)} \cdot \frac{(x+3)(x+5)}{(x+3)(x+7)}$$

$$\frac{(x-7)(x+3)(x+5)}{2(x-7)(x)(x-3)}$$

keep

$$\frac{(x+3)(x+3)}{(2x)(x-3)}$$

$$\frac{1x-3}{5x+1} \cdot \frac{15x^2-7x-2}{6x^2-13x+6}$$

$$\frac{2x-3}{5x+1} \cdot \frac{(3x-2)(5x+1)}{(2x-3)(3x-2)}$$

$$\frac{1}{1} = 1$$

-30, -10, 3, -7, $+$

$$\begin{array}{c|c|c} & 3x & -2 \\ \hline 5x & 15x^2 & -10x \\ \hline +1 & 3x & -2 \end{array}$$

do this instead of reading

36, -13

$$\frac{8x^3+27}{2x^2+3x} \cdot \frac{3x^3}{4x^2-6x+9}$$

sum of cubes

$$\frac{(2x+3)(4x^2-6x+9)}{x(x)(2x+3)} \cdot \frac{3x^3}{4x^2-6x+9}$$

$$\frac{3x^3}{x}$$ ✓ $3x^2$

GCF

$$\frac{5x^2-20}{25x^2} \div \frac{x^2+6x+8}{5x^2}$$

$$\frac{5(x^2-4)}{25x^2} \cdot \frac{5x^2}{(x+2)(x+4)}$$

$$\frac{5(x+2)(x-2)}{5\cdot 5\cdot x^2} \cdot \frac{5x^2}{(x+2)(x+4)}$$

$$\frac{x-2}{x+4}$$ ✓

$$\frac{x^2-3x-18}{15x^2+12x} \cdot \frac{2x^2+5x-3}{10x^2+3x-4}$$

$$\frac{(x-6)(x+3)}{3x(5x+4)} \cdot \frac{(5x+4)(2x-1)}{(x+3)(2x-1)}$$

$$\frac{x-6}{3x}$$ ✓ Yes!

$$\frac{x-3}{x^2-5x-14} \cdot \frac{x-7}{x^2-x-6}$$

$$\frac{x-3}{(x-7)(x+2)} \cdot \frac{x-7}{(x-3)(x+2)}$$

$$\frac{1}{(x+2)^2}$$ over 1

$$\frac{x^2+10x+24}{3x^2+3x} \div \frac{1}{x+6}$$

$$\frac{(x+4)(x+6)}{3x(x+1)} \cdot \frac{1}{(x+6)}$$

$$\frac{x+4}{3x(x+1)}$$ ✓

$$\frac{x^2+10x+25}{(x+5)(x+5)} \cdot \frac{x^2-3x-105}{x^2+12x+35}$$

$$\frac{(x+5)(x-15)}{(x+5)(x+7)} \cdot \frac{(x-15)(x+7)}{(x+5)(x+7)}$$

$$\frac{(x+5)(x-15)}{(x+5)(x+7)}$$ ✓

$$\begin{array}{r|cc} & 5x & +4 \\ \hline 2x & 10x^2 & 8x \\ -5 & -5x & -4 \end{array}$$

$$8 \quad -40 \quad -5 \quad 3 \quad 2x \quad -1$$

$$\begin{array}{r|cc} & x & +3 \\ \hline 2x & 2x^2 & 6x \\ -1 & -1x & -3 \end{array}$$

$$6 \quad -6 \quad -1 \quad 5 \quad 2x \quad 1$$

$\frac{4}{2x^2} + \frac{1}{3x}$

$\frac{4(3x)}{(2x^2)(3x)} + \frac{2x^2}{(2x^2)(3x)}$

when no = 0 keep going → factor

$\frac{11}{3(x-5)} - \frac{x+1}{3x}$

$\frac{11(x)}{3(x-5)(x)} - \frac{(x+1)(x-5)}{3x(x-5)} \rightarrow$

$\frac{11x - (x^2 - 5x + x - 5)}{(3x)(x-5)}$

$\frac{11x - x^2 + 4x + 5}{3x^2 - 15x}$ ← don't need to foil

if factorable $\frac{-x^2 + 15x + 5}{3x^2 - 15}$ can leave

$\frac{5}{2} - \frac{3x}{(x+1)}$

$\frac{5(x+1)}{2(x+1)} - \frac{3x(2)}{(x+1)2}$

$\frac{5x+5-6x}{2(x+1)}$

$\frac{-x+5}{2(x+1)}$ ✓

$\frac{3}{(x+2)} - \frac{8}{(x-2)}$

$\frac{3(x-2)}{(x+2)(x-2)} - \frac{8(x+2)}{(x+2)(x-2)} \rightarrow$

$3x - 6 - 8x - 16$

$\frac{-5x - 22}{(x+2)(x-2)}$ ✓

$\frac{x+1}{(x-2)(x-7)} - \frac{2x+1}{(x-7)}$ ← copy error

$\frac{(x+1)}{(x-2)(x-7)} - \frac{(2x+1)(x-2)}{(x-7)(x-2)}$

$\frac{x+1-(2x^2-14x+x-7)}{(x-2)(x-7)}$

$\frac{x+1-2x^2+13x-7}{(x-2)(x-7)}$

$\frac{-2x^2+14x-6}{(x-2)(x-7)}$

$\frac{-2(x^2-7+3)}{(x-2)(x-7)}$

$\frac{1}{\frac{3x+15}{2}} \quad \frac{1}{x+5} + \frac{1}{9x+20}$

$\frac{2}{\frac{3x+15}{2(4)}} \quad \frac{1}{4x+20} + \frac{1}{4x+20}$

$\frac{9}{4x+20}$

$\frac{2}{3x+15} \cdot \frac{4x+20}{9}$ copy error

$\frac{2}{3} \cdot \frac{4}{9}$

$\frac{8}{3}$ $\frac{8}{27}$

$\frac{-4x^2+2}{x^2+9x+10} + \frac{3}{x+10}$

$\frac{2(-2x^2+1)}{(x+1)(x+10)} \quad \frac{3(x-1)}{(x+10)}$

$\frac{2(-2x^2+1)}{(x-1)(x+10)} + \frac{3(x-1)}{(x-1)(x+10)}$

$\frac{-4x^2+2+3x-3}{(x-1)(x+10)}$

$\frac{-4x^2+3x-1}{(x-1)(x+10)}$

4 x
3

4	1
	-1

$$\frac{12x^2 - x + 9}{3x + 33} - \frac{16}{x+11}$$

dont GCF

$$\frac{3(4x^2 - x + 3)}{3(x+11)} - \frac{16(3)}{x+11(3)}$$

$$\frac{3(4x^2 - x + 3) - 48}{3(x+11)}$$

$$\frac{12x^2 - x - 39}{3(x+11)}$$

$$\frac{18}{x+3} + \frac{10}{3} = 6$$

$$\frac{10(3)}{3(x+3)} + \frac{10(x+3)}{3(x+3)} = \frac{6(3)(x+3)}{3(x+3)}$$

$$30 + 10x + 30 = 18(x+3)$$

$$10x + 60 = 18x + 54$$

$$-18x \quad -54$$

$$-8x + 6 = 0$$

$$-6 \quad -6$$

$$\frac{-8x}{-8} = \frac{-6}{-8}$$

$$x = \frac{3}{4}$$

∴ D

IAG IV - Independent Study Powers, Roots and Radicals

For this marking period, you will be studying the concepts of exponents. The content for each topic is located in your Algebra 2 Textbook. At the end of your studying of these topics, you should be prepared to do the following:

Powers, Roots and Radicals (7.1, 7.2, 7.4)	
▪ Use properties of exponents to evaluate and simplify exponential expressions ▪ Evaluate nth roots of real numbers using radical notation and rational exponent notation	▪ Use properties of roots to evaluate and simplify expressions containing radicals and rational exponents

For the … every pg.

- **Write … e top of your paper**
- **Cop…**
- **Sho…**
- **Eac…**
- **Ne…**

Here Factoring stuff (5/10)

Assig… …ns:

- Se… 11-49 -(27 4/9)
- Section … -53 all
- Section 7.4 p. 371 # 7,8,9,11,…,19,21,25,27,29,30,32,35,37,38,42, #55-65 odd

Good Luck.

This assignment is due on: May 3 2007

Name: Michael Plasmeier

Score: 245/26

7.1 Properties of Exponents

4/24

Simplify

349 Algebra 2

11. $2^3 \cdot 2^5$

2^{3+5} $(a^n \cdot a^m = a^{n+m})$

2^8

256

12. $(-3)^2 \cdot (-3)^1$

-3^{2+1}

-3^3

-27

didn't need to do.

13. $\left(\frac{1}{2}\right)^2 \cdot \left(\frac{1}{2}\right)^{-2}$

$\left(\frac{1}{2}\right)^{2-2}$

$\left(\frac{1}{2}\right)^0$

1 remember 0 property

15. $x^4 \cdot x^{-2}$

x^{4-2}

x^2

17. $(4^3)^2$ $(x^n)^m = a^{mn}$

$4^{3 \cdot 2}$

4^6

4096

19. $(x^{-3})^5$

$x^{-3 \cdot 5}$

x^{-15}

1 more step

$\frac{1}{x^{15}}$

IAG IV - Independent Study Powers, Roots and Radicals

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Powers, Roots and Radicals 7.1, 7.3, 7.4	Roots
▪ Use properties of exponents to evaluate and simplify exponential expressions ▪ Evaluate nth roots of real numbers using radical notation and rational exponent notation	▪ Use properties of roots to evaluate and simplify expressions containing radicals and rational exponents

For the assignments below: -1 every pg.

- **Write the section and problem #'s at the top of your paper**
- **Copy the problem**
- ***Show all work***
- **Each section should be a new page**
- **Neatness and organization count**

Assignments are for the following sections:

- Section 7.1: p. 349- #11-33 odds, #49 $-(27^{4/9})$
- Section 7.3 p. 364 #7-17 odds, 43-53 all
- Section 7.4 p. 371 # 7,8,9,11,13,19,21,25,27,29,30,32,35,37,38,42, #55-65 odd

Good Luck.

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7.1 Properties of Exponents

4/24

Simplify rational exponents

349 Algebra 2

11. $2^3 2^5$

2^{3+5} $(a^n \cdot a^m = a^{n+m})$

2^8

256

12. $(-3)^2 \cdot (-3)^1$

-3^{2+1}

-3^3

-27

(I didn't need to do.)

13. $\left(\frac{1}{2}\right)^2 \cdot \left(\frac{1}{2}\right)^2$

$\left(\frac{1}{2}\right)^{2-2}$

$\left(\frac{1}{2}\right)^0$

1 (remember 0 property)

15. $x^4 \cdot x^{-2}$

x^{4-2}

x^2

17. $(4^3)^2$ $(a^n)^m = a^{mn}$

$4^{3 \cdot 2}$

4^6

4096

19. $(x^{-3})^5$

$x^{-3 \cdot 5}$

x^{-15}

$\frac{1}{x^{15}}$ 1 more step

21. $(x^3y)^4$

$x^{3\cdot4}y^4$

$x^{12}y^4$

23. $(-3x^2)^2$

$-3^2x^{2\cdot2}$

$9x^4$

25. $4x^{-1}y$

$4\frac{1}{x}y \rightarrow \frac{4y}{x}$

27. $3x^0y^4$

$3\cdot1y^4$

$3y^4$

29. $\frac{4^3}{4^1} \rightarrow \frac{64}{4} \rightarrow 16$

31. $\frac{x^3y}{xy^2}$ $\frac{y^3}{x^4}$

33. $\frac{6x}{5y} \cdot \frac{y^2x^{-2}}{x^3}$

$\frac{6x}{5y} \cdot \frac{y^2}{x^5}$

$\frac{6xy^2}{5x^5y}$

$\frac{6y^2}{5x^4y}$

$\frac{6y}{5x^4}$

7.3 Powers, Roots & Radicals

4/24

BC4 Algebra 2

Rewrite as rational exponents

7. $\sqrt[5]{12}$
$12^{1/5}$

9. $\sqrt[3]{16}$
$16^{1/3}$

11. $\sqrt[4]{2}$
$2^{1/4}$

Rewrite as Radical

13. $4^{1/3}$
$\sqrt[3]{4}$

15. $10^{1/6}$
$\sqrt[6]{10}$

17. $3^{1/4}$
$\sqrt[4]{3}$

19. cube root of 3
$\sqrt[3]{3}$

21. sixth root of 9
$\pm \sqrt[6]{9}$
why? do you need this

23. fourth root of 10
$\pm \sqrt[4]{10}$

Evaluate

43. $16^{-3/2}$
$\sqrt{16^{-3}}$
4^{-3}
$\frac{1}{4^3} \rightarrow \frac{1}{64}$

44. $4^{7/2}$

$\sqrt{4^7}$

2^7

128

45. $81^{3/4}$

$\sqrt[4]{81^3}$

3^3

27

46. $64^{-2/3}$

$\sqrt[3]{64^{-2}}$

4^{-2}

$\frac{1}{4^2} \rightarrow \frac{1}{16}$

47. $125^{2/3}$

$\sqrt[3]{125^2}$

5^2

25

48. $-8^{5/3}$ was copy error

$-(\sqrt[3]{8^5})$

$-(\sqrt[3]{32768})$

-32

49. $-27^{4/3}$

$-[\sqrt[3]{27^4}]$; separate negitive out; why?

$-[3^4]$

-81

Properties of Roots of Real #'s

5/1

50. $4^{3/2}$

$\sqrt{9^3}$

3^3

27

51. $8^{2/3}$

$\sqrt[3]{8^2}$

2^2

4

52. $25^{3/2}$

$\sqrt{25^3}$

5^3

125

53. $100^{3/2}$

$\sqrt{100^3}$

10^3

1000

7.4 Properties of Roots of Real #s

5/1

Simplify

7. $3^{\frac{1}{4}} \cdot 3^{\frac{3}{4}}$

$3^{\frac{1}{4}+\frac{3}{4}}$

3^1

(3)

8. $\sqrt[3]{4} \cdot \sqrt[3]{16}$

$\sqrt[3]{4 \cdot 16}$

$\sqrt[3]{64}$

(4)

9. $\sqrt[4]{20} \cdot \sqrt[4]{\frac{4}{5}}$

$\sqrt[4]{20 \cdot \frac{4}{5}}$

$\sqrt[4]{16}$

(2)

11. $\left(\frac{1}{3}\right)^{\frac{1}{5}} \cdot \left(\frac{1}{3}\right)^{\frac{2}{5}}$

$\left(\frac{1}{3}\right)^{\frac{1}{5}+\frac{2}{5}}$

$\left(\frac{1}{3}\right)^{\frac{3}{5}}$

13. $\left(4^{\frac{1}{4}}\right)^{3/4}$

$4^{\frac{1}{4} \cdot \frac{3}{4}}$

$4^{\frac{3}{16}}$

$\left(4^{\frac{3}{4}}\right)$

$\sqrt[4]{4^3}$

$\sqrt[4]{64}$

18. $\left(243 y^5\right)^{\frac{1}{5}}$

$\sqrt[5]{243} \cdot \sqrt[5]{y^5}$

$3\sqrt[5]{y^5}$

35. $\frac{\sqrt[3]{648}}{\sqrt[3]{3}} \rightarrow \sqrt[3]{216} \rightarrow 6$

37. $\sqrt[4]{6x^4}$
$\sqrt[4]{6} \cdot \sqrt[4]{x^4}$
$\sqrt[4]{6}|x|$

38. $\sqrt[3]{27x^3y^3}$
$\sqrt[3]{27} \cdot \sqrt[3]{x} \cdot \sqrt[3]{y^3}$
$3\sqrt[3]{x}y$ x odd
$3y\sqrt[3]{x}$

42. $\frac{\sqrt[3]{8x^9}}{\sqrt[3]{8}}$
$\sqrt[3]{x^9}$
$(2x^3)$
Simplify

55. $\sqrt[4]{5} + 4\sqrt[4]{5}$
$5\sqrt[4]{5}$

57. $4\sqrt[4]{6} - 6\sqrt[4]{6}$
$-2\sqrt[4]{6}$

59. $\sqrt[4]{768} - 3\sqrt[4]{3}$
$\sqrt[4]{256} \cdot \sqrt[4]{3} - 3\sqrt[4]{3}$
$4\sqrt[4]{3} - 3\sqrt[4]{3}$
$\sqrt[4]{3}$

61. $\sqrt[3]{270} + 2\sqrt[3]{10}$
$\sqrt[3]{10} \cdot \sqrt[3]{27} + 2\sqrt[3]{10}$
$3\sqrt[3]{10} + 2\sqrt[3]{10}$
$5\sqrt[3]{10}$

63. $\sqrt[5]{1701} + 4\sqrt[5]{7}$

$\sqrt[5]{243} \cdot \sqrt[5]{7} + 4\sqrt[5]{7}$

$3\sqrt[5]{7} + 4\sqrt[5]{7}$

$7\sqrt[5]{7}$

be able to do w/o calc for test!

65. $\sqrt[5]{160} - \sqrt[5]{1215}$

$\sqrt[5]{5}\sqrt[5]{32} - \sqrt[5]{5}\sqrt[5]{243}$

$2\sqrt[5]{5} - 3\sqrt[5]{5}$

$-\sqrt[5]{5}$

Name Michael Plasmeier

Date _____

Block _____

Properties of Exponents

Directions: Read through the example of each rule and interpret them as best as possible. If you have problems, read through **pgs. 346 - 347** of your text. That may be of some help. DO NOT just skip over the example problems, you may become confused. One concept that will help you is how to expand exponents (ex. $2^3 = 2 \cdot 2 \cdot 2$). If you start to get frustrated it's O.K., we'll go over <u>all</u> of this tomorrow. So please make sure that this goes in your notebook as notes for this section.

$-x^n$ Solution

if n = even → (+)

if n = odd → (−)

<u>Product of Powers Property</u>: $a^m \cdot a^n = a^{m+n}$

EX. $3^2 \cdot 3^3$

Expanded Form: $(3 \cdot 3) \cdot (3 \cdot 3 \cdot 3)$

How many 3's are there? 5

Rewritten Form -- 3^5

How can this be written instead of having to expand the problem? $3^{2+3} = 3^5$

Answer: 243

1) $(2)^3 \cdot (2)^2$ $(2 \cdot 2 \cdot 2) \cdot (2 \cdot 2)$ 2^5 32

2) $(-3)(-3)^5$ -3^6 729

3) $(x)^5(x)^4$ x^9

Solve it

<u>Power of a Power Property:</u> $(a^m)^n = a^{m \cdot n}$

EX. $(5^2)^3$

Expanded Form: $(5 \cdot 5)^3 = (5 \cdot 5) \cdot (5 \cdot 5) \cdot (5 \cdot 5)$

How many 5's are there? 6

Rewritten Form -- 5^6

How can this be written instead of having to expand the problem? $5^{2 \cdot 3} = 5^6$

Answer: 15625

1) $(2^3)^2$ 2) $[(-2)^3]^3$ 3) $(x^3)^4$

$2^{3\cdot2}$ $(-2)^{3\cdot3}$ multiply $x^{3\cdot4}$

2^6 $(-2)^9$ x^{12}

64 -512

Power of a Product Property: $(a\cdot b)^m = a^m \cdot b^m$

EX. $(5\cdot3)^3$

Expanded Form:

How many 5's are there? 3 How many 3's are there? 3

Rewritten Form -- $5^3\cdot3^3$

How can this be written instead of having to expand the problem? $(5\cdot3)^3 = 5^3\cdot3^3$

Answer: $125\cdot27 = 3375$

1) $(4\cdot5)^2$ 2) $(z\cdot y)^3$ 3) $(3^2xy)^4$

OR $4^2\cdot5^2$ $2^3\cdot y^3$ $3^{2\cdot4}\cdot x^4 y^4$

20^2 $16\cdot25$ $3^8\cdot x^4\cdot y^4$

400 400 $6561x^4y^4$

Negative Power Property: $a^{-n} = \frac{1}{a^n}, a \neq 0$

EX. 4^{-2}

** Any number with a negative exponent can be rewritten as a fraction where the denominator is that same base number BUT with a positive exponent.

Therefore,

$$4^{-2} = \frac{1}{4^2} = \frac{1}{16}$$

$-x^1$ $3^3 = 27$ ÷3

$3^2 = 9$ ÷3

$3^1 = 3$ ÷3

$3^0 = 1$ ÷3

$3^{-1} = \frac{1}{3}$

$3^{-2} = \frac{1}{9} = \frac{1}{3^2}$

1) 5^{-3} 2) 3^{-4}

$\frac{1}{5^3} \rightarrow \frac{1}{125}$ $\frac{1}{3^4} \rightarrow \frac{1}{81}$

How do you think you could simplify a fraction whose denominator had a negative exponent?

1) $\frac{1}{3^{-2}}$ 2) $\frac{1}{6^{-2}}$

3^2 6^2

9 36

Zero Power Property: $a^0 = 1, a \neq 0$

EX. 5^0

****NOTE:** Any number/variable with an exponent of "0" is equal to 1.

1) $(36)^0$ 2) $(z)^0$ 3) $(b \cdot d)^0$

1 2 bd

Quotient of Powers Property: $\frac{a^m}{a^n} = a^{m-n}, a \neq 0$

EX. $\frac{2^6}{2^4}$

Expanded Form: $\frac{2 \cdot 2 \cdot 2 \cdot 2 \cdot 2 \cdot 2}{2 \cdot 2 \cdot 2 \cdot 2}$

Can the above be simplified? How many 2's will cancel in the numerator?

$\frac{\cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot 2 \cdot 2}{\cancel{2} \cdot \cancel{2} \cdot \cancel{2} \cdot \cancel{2}}$

How many 2's are left? 2

Rewritten form -- 2^2

How can this be written instead of having to expand the problem?

$2^{6-4} = 2^2$

Answer: 4

1) $\left(\frac{5^4}{5^1}\right)$ 2) $\left(\frac{7^5}{7^3}\right)$ 3) $\left(\frac{a^{10}}{a^7}\right)$

5^{4-1} 7^{5-3} a^{10-7}

5^3 7^2 a^3

125 49

Power of a Quotient Property: $\left(\frac{a}{b}\right)^m = \frac{a^m}{b^m}, b \neq 0$

EX. $\left(\frac{5}{3}\right)^2$

Expanded Form: $\left(\frac{5}{3}\right)\cdot\left(\frac{5}{3}\right) = \left(\frac{5\cdot 5}{3\cdot 3}\right)$

How many 5's are there? 2 **How many 3's are there?** 2

Rewritten Form -- $\frac{5^2}{3^2}$

Answer: $\frac{25}{9} = 2.77$

1) $\left(\frac{7}{4}\right)^3$ 2) $\left(\frac{3}{2}\right)^2$ 3) $\left(\frac{m}{n}\right)^6$

$\frac{7^3}{4^3}$ $\frac{3^2}{2^2}$ $\frac{m^6}{n^6}$

$\frac{343}{64}$ $\frac{9}{2^2}$

5.359473

Name _____ Period ____

Manipulating Powers

1) $(a^x)^y = a^{xy}$	4) $(ab)^x = a^x b^x$	7) $\frac{1}{a^{-x}} = a^x$
2) $a^x \cdot a^y = a^{x+y}$	5) $\left(\frac{a}{b}\right)^x = \frac{a^x}{b^x}$	
3) $\frac{a^x}{a^y} = a^{x-y}$	6) $a^{-x} = \frac{1}{a^x}$	

Simplify each expression.

Example: $(x^2)^4 = x^{2 \cdot 4} = x^8$

1. $x^4 \cdot x^2$

4^{4+2} 4^6 4096

2. $\frac{x^8}{x^6}$ x^{8-6} x^2

3. $(x^2y)^3$

$x^{2 \cdot 3}$ y^3 $x^6 y^3$

4. $\left(\frac{x}{y^3}\right)^5$ $\frac{x^5}{y^{3 \cdot 5}}$ $\frac{x^5}{y^{15}}$

5. y^{-15} $\frac{1}{y^{15}}$

6. $\frac{1}{x^{-15}}$ x^{15}

7. $\frac{a^6}{a^9}$ a^{6-9} a^{-3} $\frac{1}{a^3}$

8. $(2c^2)^3$

$2^3 c^{2 \cdot 3}$ $8c^6$

9. $\frac{n^4 \cdot n^6}{n^8 \cdot n^2}$ $\frac{n^{4+6}}{n^{8+2}}$ $\frac{n^{10}}{n^{10}}$ n^{10-10} $n^0 \to (1)$

10. $4a^5 \cdot 3a^3$

$4 \cdot 3 \cdot a^{5+3}$ $12a^8$

11. $\left(\frac{v}{3}\right)^4 \cdot \left(\frac{5}{v}\right)^2$ $\frac{v^4}{3^4} \cdot \frac{5^2}{v^2}$ $\frac{v^4}{81} \cdot \frac{25}{v^2}$ $\frac{25v^4}{81v^2}$ $\frac{25}{81}v^{4-2}$ $\frac{25}{81}v^2$

12. $(x^{-2})^2$

$x^{-2 \cdot 2}$ x^{-4} $\frac{1}{x^4}$

13. $\left(\frac{2}{x}\right)^{-1}$

$\frac{2^{-1}}{x^{-1}}$ $\frac{1}{x^{-1}}$ $\frac{1}{2x^{-1}}$ flip

Name _____ Period ____

Manipulating Powers (cont.)

17-20

14. $(x^{-2} \cdot y)^{-3}$

15. $\frac{12x^5}{3x^7}$

16. $\frac{8d}{(10d^{-4})(9d^2)}$

17. $-2x^{-2}$ $\frac{-2}{x^2}$

18. $x^{\frac{1}{3}} \cdot x^{\frac{2}{3}}$ $x^{\frac{1}{3}+\frac{2}{3}}$ x^1 x

19. $\left(\frac{8x}{125}\right)^{-2}$ $\frac{8^{-2}x^{-2}}{125^{-2}}$ $\frac{64\ \frac{1}{x^2}}{64000}$ $\frac{1}{x^2}/10{,}000$

20. $\frac{a^4 \cdot b^6 \cdot a^9}{b^{-2}}$ $\frac{a^{4+9}b^6}{\frac{1}{b^2}}$ $\frac{a^{13}b^6}{\frac{1}{b^2}}$

21. $\frac{x^{-4}y^{-6}}{x^2y^5z}$

22. $\left(\frac{x^2}{(xz)^2}\right)^{-2}$

23. $\left(\frac{x^2y^1z}{a^4b^{-7}}\right)^{-3}$

24. $(x^2y^2)^{-2} \cdot x^4y^{19}$

25. $\left(\frac{x^{-4}}{y^6}\right)^3 \cdot \left(\frac{x}{y}\right)^{-4}$

26. $(a^2b^1c^8)^6 \cdot a^{-9} \cdot b^4 \cdot x$

27. $\left(\frac{x^{-4}b^{-1}}{4}\right)^{-3} \cdot 2x^5$

28. $(a^9b^{-2}c^1)^{-4} \cdot \left(\frac{ab}{x}\right)^3$

29. $\left(\frac{x^{-4}y^{-6}z^{10}}{a^1b^2c^{-4}}\right)^{-2} \cdot \left(\frac{a^1bc^{-4}}{x^6yz^9}\right)^5$

Name Michael Plasmeier

Date 4/20

Section 7.3: n^{th} Root and Rational Exponents

PLEASE READ!!!

This section deals with finding roots of numbers. In order to do so, review the following:

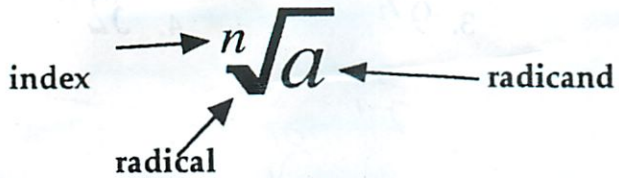
"Perfect Squares"	"Perfect Cubes"	"Perfect 4's"	"Perfect 5's"
$2^2 =$ 4			
$3^2 =$ 9	$1^3 =$ 1	$1^4 =$ 1	
$4^2 =$ 16	$2^3 =$ 16	$2^4 =$ 16	$1^5 =$ 1
$5^2 =$ 25	$3^3 =$ 27	$3^4 =$ 81	$2^5 =$ 32
$6^2 =$ 36	$4^3 =$ 64	$4^4 =$ 256	
$7^2 =$ 49	$5^3 =$ 125		
$8^2 =$ 64			
$12^2 =$ 144			
$15^2 =$ 225			

$2^6 = 64$

$13^2 = 169$ $14^2 = 196$ ← $6^3 = 216$ $7^3 = 343$ $5^4 = 625$

We will use these (along with the corresponding negatives → $(-2)^3 = -8$) in order to simplify all of the expressions in this Section 7.3.

VOCABULARY



The way that the above is written is referred to as **radical notation.

Index: the root of the radicand that you are finding (the square root if n = 2, the cube root if n = 3, the 4th root if n = 4, etc.)

Radicand: the number underneath the radical sign

The following statement is true.

$\sqrt[n]{a} = a^{1/n}$ where 1 represents the exponent of "a" and "n" represents the index.

$\sqrt[2]{16} = \sqrt{16}$ assumed

Simplify the following:

1. $\sqrt[3]{8}$ $8^{\frac{1}{3}}$ 2
2. $\sqrt[3]{64}$ $64^{\frac{1}{3}}$ $4 \rightarrow (4^3 = 64)$
3. $\sqrt[4]{81}$ $81^{\frac{1}{4}}$ 3
4. $\sqrt[5]{-32}$ $(-32)^{\frac{1}{5}}$ -2
5. $\sqrt[3]{-27}$ $(-27)^{\frac{1}{3}}$ -3
6. $\sqrt[3]{-64}$ $(-64)^{\frac{1}{3}}$ -4

If $\sqrt[n]{a} = a^{1/n}$, how could you simplify the following?

(HINT: Rewrite the expressions in radical notation and simplify)

1. $16^{1/2}$ $\sqrt[2]{16} = \sqrt{16} = 4$
2. $(-27)^{1/3}$ $\sqrt[3]{-27}$
3. $625^{1/4}$ $\sqrt[4]{625}$

If an expression is in the form of $a^{1/n}$, what does the **n** represent?

On the front of this worksheet, it was stated that the 1 (the numerator) represents of the exponent of a. What would happen to **a** if the exponent (or numerator of the fractional exponent) was different that 1?

en

Try simplify the following expressions: **(try doing these without your calculator)**

1. $4^{3/2}$ $\sqrt[2]{4^3}$ $\sqrt{64}$ 8
2. $8^{2/3}$ $\sqrt[3]{8^2}$ $\sqrt[3]{64}$ 4
3. $9^{-1/2}$ $\sqrt{9^{-1}}$ $\sqrt{\frac{1}{9}}$ $\frac{1}{3}$ or 3^{-1} $\frac{1}{3}$ 2 ways
4. $32^{-3/5}$ $\sqrt[5]{32^{-3}}$ 2^{-3} $\frac{1}{2^3}$ $\frac{1}{8}$

or $\sqrt{}$ first

$625^{3/4}$

$\sqrt[4]{625^3}$

5^3

125

7.4 Properties of Roots of Real #s Notes

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Product property = $\sqrt[m]{a \cdot b} = \sqrt[m]{a} \cdot \sqrt[m]{b}$

Quotient property = $\sqrt[m]{\frac{a}{b}} = \frac{\sqrt[m]{a}}{\sqrt[m]{b}}$

example: $\sqrt{\frac{121}{64}} = \frac{\sqrt{121}}{\sqrt{64}} = \frac{11}{8}$ ↓ 2 ways to solve

$\sqrt{\frac{75}{3}} = \sqrt{25} = 5$

Properties of exponents with rational exponents

example $5^{1/3} \cdot 5^{1/4}$

$5^{\frac{1}{3}+\frac{1}{4}}$

$5^{\frac{7}{12}}$ ↓ make common denom to × $\frac{4}{12} + \frac{3}{12}$

ex2 $\frac{1}{4^{-3/2}}$

$4^{3/2}$ ← if directions say "leave √ & exponent" can leave it here

$\sqrt{4^3}$

$\sqrt{64}$

8

ex3 $6^{\frac{1}{3}} \cdot 108^{\frac{1}{3}}$

$648^{\frac{1}{3}+\frac{1}{3}}$ only add exponents when same bases

$648^{\frac{1}{3}}$

$\sqrt[3]{648}$ ✗

~~8.65~~ ✗ find largest cube no decimals

$\sqrt[3]{216} \cdot \sqrt[3]{3}$

$6\sqrt[3]{3}$

Simplifying expressions involving variables

$\sqrt[3]{8x^3} = \sqrt[3]{8} \cdot \sqrt[3]{x^3}$

$2x$

$\sqrt[2]{4x^2} = \sqrt{4} \cdot \sqrt{x^2}$

$2|x|$

when the index is even, use abs bars around variable

↳

$\sqrt[n]{x^n} = |x|$ when n is even

$\sqrt[n]{x^n} = x$ when n is odd

$n = n$ (index = exponent)

$\sqrt[2]{16x^8}$

$\sqrt{16} \cdot \sqrt{x^8}$

$4x^4$

↑ no bars because index ≠ exponent

Like radicals

same index + radican (# under √)

$5\sqrt[4]{3} + 6\sqrt[4]{3}$

$7\sqrt[4]{3}$

$\sqrt[3]{6} + \sqrt[3]{48}$

$\sqrt[3]{6} + \sqrt[3]{6} \cdot \sqrt[3]{8}$

$\sqrt[3]{6} + 2\sqrt[3]{6}$

$3\sqrt[3]{6}$

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Chapter 7: Powers, Roots, and Radicals

Directions: Simplify the following expressions without using your calculator. **ALL OF YOUR ANSWERS MUST BE SIMPLIFIED AS MUCH AS POSSIBLE!!!!! YOU MUST SHOW ALL YOUR WORK IN ORDER TO RECEIVE FULL CREDIT.** In other words, you must show how you are using one of the properties of exponents to receive full credit as you did on your last quiz. **DO NOT WRITE ANY OF YOUR ANSWERS AS DECIMALS!!**

2 POINTS EACH:

1. $2^6 \cdot 2^{-3}$

2. $\left(\frac{5}{x}\right)^{-2}$

3. $3^0 \cdot 3^3 \cdot 3$

4. $\sqrt{18}$

5. $\sqrt{7x^2}$

6. $\frac{\sqrt{80}}{\sqrt{10}}$

7. $\sqrt[3]{-64x^3}$

8. $15\sqrt[4]{3} - (-2\sqrt[4]{3})$

3 POINTS EACH:

9. $(-2 \cdot 3^2)^2$

10. $\left(\frac{4}{81}\right)^{-3/2}$

4 POINTS EACH:

11. $\sqrt[4]{32} + 5\sqrt[4]{2}$

12. $\sqrt[3]{27x^6y^9}$

PART 2: Chapter 7 Test **Name** _____

Directions: Simplify and complete the following problems. Do not leave any negative exponents. SHOW ALL WORK!!!!!!!! You may use your calculator on this section **but do not use ANY decimals in your answers**. If you have a program in your calculator that will help you solve the following problems, you must AT LEAST show the substitution of the values into the formula(s).

2 POINTS EACH:

1. $\frac{x^{-5}}{x^{8}}$

$\frac{1}{x^8 x^5}$

$\frac{1}{x^{13}}$

2. $(81x)^{\frac{1}{4}}$

$81^{\frac{1}{4}} x^{\frac{1}{4}}$

$\sqrt[4]{81}\ \sqrt[4]{x}$

$3\sqrt[4]{x}$

3. $\sqrt[3]{x^7}$ split up

$\sqrt[3]{x^3}\ \sqrt[3]{x^4}$

$x\sqrt[3]{x^4}$

$x \cdot x$'s $\quad x\sqrt[3]{x^3}\sqrt[3]{x}$

x^2 not $2x$ $\quad x^2\sqrt[3]{x}$

3 POINTS EACH:

4. $(3x^2y)^{-2}$

$3^{-2}(x^2)^{-2}y^{-2}$

$\frac{1}{3^2}x^{2\cdot-2}\frac{1}{y^2}$

$\frac{1}{3^2x^4y^2}$

5. $\frac{2^{\frac{1}{9}}}{2^{\frac{5}{6}}}$ same base subtract exponents

$\frac{\sqrt[9]{2}}{\sqrt[6]{2^5}}$ $\quad \frac{\sqrt[9]{2}}{\sqrt[6]{36}}$ ←?

$2^{\frac{1}{4}-\frac{5}{6}}$

...

4 POINTS EACH:

6. $\left(\frac{1}{4}x^3y^4\right)\cdot\left(x^{-1}y^2\right)^3$

$\frac{1}{4}x^3y^4 \cdot \frac{1}{x^3}y^6$

$\frac{x^3y^{10}}{4x^3}$ ↓ $\frac{y^{10}}{4}$

7. $\left(\frac{3x}{y^{-3}}\right)^3\cdot\left(\frac{5x^{-10}y}{2x^{-1}y^3}\right)$

$\frac{9x^3y^9 \cdot 5x^{-10}y}{2x^{-1}y^3}$

$\frac{45y^7}{2x^6}$

4 8 16 32 64 128 256 512 1024
2·2·2·2·2·2·2·2·2·2

16 64 256 1024
4·4·4·4

64
4
256

Name _____

PART D: Simplify the following expressions as much as possible without using a calculator.

1. $8^{4/3}$

$\sqrt[3]{8^4}$

2^4 ✓

16

2. $4^{-5/2}$

$\sqrt{4^{-5}}$

$\sqrt{\frac{1}{4^5}}$

$\sqrt{\frac{1}{1024}}$

$\frac{1}{32}$ ✓ now have to

3. $32^{3/5}$

$\sqrt[5]{32^3}$

$\sqrt[5]{32768}$

8 ~~6~~ I know that should have

32
32
64
960
1024
32
2048
30720
32768

4. $36^{-3/2}$

$\sqrt{36^{-3}}$

6^{-3}

$\frac{1}{6^3}$

$\frac{1}{216}$ ✓

3
36
6
216

5. $\sqrt[4]{16}$

2 ✓

6. $\left(\sqrt[3]{-64}\right)^2$

-4^2

16 ✓

What do you know about factoring?

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$-4x-1 \neq 4x+1$

every sign different

Directions: Use what you already know about factoring to completely factor the following problems.

GCF

+ ×

I not just

1. $3n^2+9n$ $3n(n+3)$
2. $12x+8xy$ $4x(3+2y)$
3. $5x^2-20x+10$ $5(x^2-4x+2)$
4. $9-16m^2$ $(4m-3)(-4m-3)$ don't just factor - get
5. $5k^3+15k^2+10k$ $5k(k^2+3k+2) \rightarrow 5k(k-1)(k-2)$
6. $18x^3-42x^2$ $6x^2(3x-7)$
7. n^3+n^2+n $n(n^2+n+1)$
8. $3x-12x^3$ $3x(1-4x^2) \rightarrow 3x(1-2x)(1+2x)$
9. $14+52x-16x^2$ $2(7+26x-8x^2) \rightarrow 2(-4x-1)(-2x+7)$
10. $6x^2+21x+9$ $3(2x^2+7x+3) \rightarrow 3(2x+1)(x+3)$
11. $81x^2-49y^2$ $(9x-7y)(9x+7y)$ diff 2 squares
12. $2x^3+12x^2+18x$ $2x(x^2+6x+9) \rightarrow 2x(x+3)(x+3)$ or $2x(x+3)^2$
13. $25x^2+30x+9$ $(5x+3)(5x+3) \rightarrow$ or $\rightarrow (5x+3)^2$
14. $16x^4-81$ $\rightarrow (4x^2-9)(4x^2+9) \rightarrow (2x-3)(2x+3)(4x^2+9)$
15. x^4-4x^2+3

$(x^2-3)(x^2-1)$ diff of 2 squares

$(x^2-3)(x+1)(x-1)$

10.3 Multiplying + Dividing Rational Expressions Problems 5/3

Simplify

5. $\frac{x^2+6x+9}{x^2-9}$

$\frac{(x+3)(x+3)}{(x+3)(x-3)}$

$\frac{x+3}{x-3}$

6. $\frac{x^2-3x+2}{x^2+5x-6}$

$\frac{(x-2)(x-1)}{(x+6)(x-1)}$ ← factor error

$\frac{x-2}{x+6}$

7. $\frac{x^2-2x-3}{x^2-7x+12}$

$\frac{(x-3)(x+1)}{(x-3)(x-4)}$

$\frac{x+1}{x-4}$

8. $\frac{x-2}{x^3-x^2-4}$

$\frac{x-2}{x^3-(x+2)(x-2)}$

$\frac{1}{x^3-x+2}$

factor

Multiply + Simplify

9. $\frac{3xy^3}{x^3y} \cdot \frac{y}{6x}$

$\frac{3xy^4}{6x^4y}$

$\frac{y^3}{2x^3}$

10. $\frac{120x^5}{y^4} \cdot \frac{xy}{5x^3}$

$\frac{120x^6y}{5x^3y^4}$

$\frac{24x^3}{y^3}$

11. $\frac{16x^3}{5y^4} \cdot \frac{x^3y^4}{80xy^2}$

$\frac{16x^6y^4}{400xy^{11}}$

$\frac{x^5}{25y^5}$

12. $\frac{x^{10}y^4}{33x^9} \cdot \frac{39x^5}{4y^{10}}$

$\frac{39x^{15}y^4}{132x^9y^{10}}$

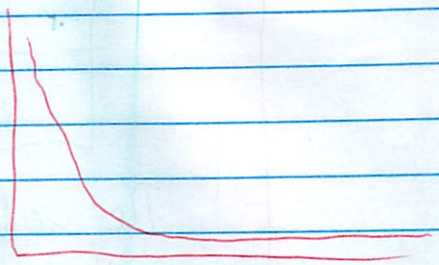
$\frac{13x^{11}}{44y^6}$

Warmup 5/4

5/4

1. If a $2000 treadmill depreciates 5%/year. When is it worthless

Year	$ value
0	2,000
1	1,900
2	1,805
3	1714,75
4	1629,01
5	1547,56
6	1470,18
7	1396,67
8	1326,84
9	1260,50
10	1197,47
11	1137,60
12	1080,72
13	1026,68
14	975,35
15	926,58
16	880,25
17	836,24
18	794,43
19	754,71
20	716,97
21	681,12
22	647,07
23	614,71
24	583,98
25	554,78
26	527,04
27	500,69



years

asymptote is 0

→ get closer to, but never touches

58 years = < $100

72 years = < $50

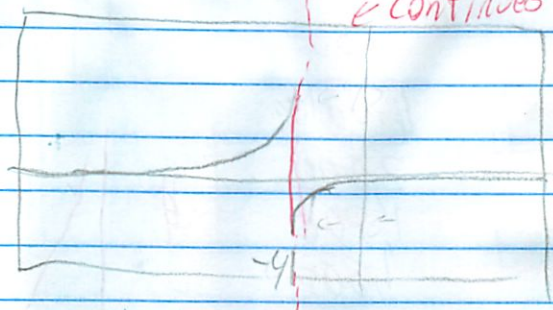
97 years = < $10

~135 years = < 1

and on and on

will never be "worthless" but is not worth much

2. Graph $y = \frac{-7}{x+4}$



← continues up forever

Goes straight + then curves upward

Vertical line going down ... then continues opposite of other one

The vertical ~~appearing~~ line indicates that the values increase sharply and go to infinity as x gets smaller

vertical line is asymptote ↑ vertical) where

At -4 = error because ~~middle~~ no xs for that y (divide by 0 error)

$\frac{-7}{-4+4} = \frac{-7}{0}$ ← error

Never touches vertical line to find

10.1 Rational Functions + Asymptotes

5/4

rational function - function defined as $f(x) = \frac{g(x)}{h(x)}$
where $g(x)$ & $h(x)$ are functions

simple: "a function which is a division of 2 functions"
↑ for every x value - one y value

asymptote - a line which exists on a graph that represents where a function is undefined

Graph approaches line, but never touches (intersect) it

Vertical asymptote:

To solve make denom = 0 + solve

$f(x) = \frac{3}{x+2}$ $x = -2$ ← when this = 0

$f(x) = \frac{-2}{x^2-25}$ $x = 5, x = -5$ + or − ↗ ↘

$f(x) = \frac{6}{x^3-8}$ $x = 2$ ↑ prefix ans w/ x=

⊖ doesn't work w/ n = odd

See more on worksheet

5/4

Name: _____ Date: _____

A Calculator Investigation Into Asymptotes

As we've seen, rational functions can have both vertical and horizontal asymptotes. We've discussed how you can determine the vertical asymptote by using the equation and not having to look at the graph. However, we have yet to discover how the equation can tell you the equation(s) of the horizontal asymptotes. This activity will help you do that. For each equation in each of the following sections, 1) determine the equation for the VERTICAL asymptote without using the graph, 2) graph the rational function on your calculator and 3) determine the equation of the HORIZONTAL asymptote (if one exists). Answer the questions that follow each investigation.

$x^2+2x-8=0$
$+8 \quad +8$
$x^2+2x=8$
$2^2+2(2)=4$

PART A:

1) $\frac{x}{x^2-4}$ write as $x=2$ $x=-2$

Vertical: ~~2, 2~~

Horizontal: $y=0$

2) $\frac{3x}{x^2+2x-8}$

Vertical : $x=2, x=-4$ ealso

Horizontal: $y=0$

3) $\frac{x^2-2}{x^3-27}$

Vertical: $x=3$

Horizontal: $y=0$

Question: What do you notice about the equation for the horizontal asymptote?

Its always 0

Question: What do you notice about the degree of the numerator vs. the degree of the denominator in each of the problems?

largest exponent of polynomial

Denumerators is always (x) not always 1

degree of the demonamator

Conclusion:

degree numerator < degree denominator else

When the degree of the numerator < degree denominator then horizontal asymptote $y=0$

dont G+V;
Solve for: $3x-2=0$
$+2 \quad +2$
$\frac{3x}{3}=\frac{2}{3}$
$x=\frac{2}{3}$

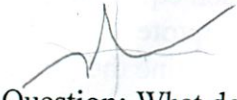
$x^2-13x+30=0$
$-30 \quad -30$
$x^2-13x=-30$

PART B:

1) $\frac{x^2}{x+7}$

Vertical: $x=-7$

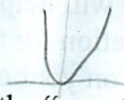
Horizontal: more



2) $\frac{x^3}{3x-2}$

Vertical: $x=\frac{2}{3}$

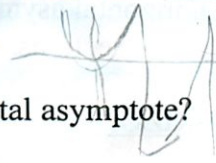
Horizontal: none



3) $\frac{5x^6+3x^4-2x+6}{x^2-13x+30}$

Vertical: $x=3, \ x=10$

Horizontal: none



Question: What do you notice about the "equation" for the horizontal asymptote?

All none

Question: What do you notice about the degree of the numerator vs. the degree of the denominator in each of the problems?

degree numerator > degree denominator

Conclusion:

If degree (numerator) > degree (denominator) then there is no horizontal asymptote

PART C:

1) $\frac{x+2}{x-1}$

Vertical: $x=1$

Horizontal: $y=1$

crosses 0

2) $\frac{18x^2-2x-3}{9x^2-81}$

Vertical: $x=3, \ x=-3$

Horizontal: ~~$y=0$~~ $y=2$

3) $\frac{12x^2+4}{3x^2+12x+9}$

check for multiple ans

Vertical: $x=-3, \ x=-1$

Horizontal: $y=4$

$3x^2+12x+9=0$
$3(x^2+4x+3)=0$
$3(x+3)(x+1)$
$x+3 \quad x+1$
$x=-3 \quad x=-1$

Question: What do you notice about the equation for the horizontal asymptote?

infront of degree → (leading coefficient (numerator)) / (leading coefficient (denominator))

Don't Guess ☺

Question: What do you notice about the degree of the numerator vs. the degree of the denominator? Do the leading coefficients have anything to do with the pattern?

degree (numerator) = degree (denominator)

Conclusion:

If degree (num) = degree (den) then horizontal asymptote will be ratio of leading coefficient (num: l.c. (denom)

10.1 Graphs of Rational Functions

5/8

p521-522 Identify Horizontal + Vertical Asymptotes

if degree(num) < d.(d.) $y = 0$

if degree(num) > d(b) y = None

if degree(num) = d(den) $asy = \frac{\text{lead. coef. (num)}}{\text{l.c. (denom)}}$

15. $\frac{1}{x-5}$ $x = 5$ $y = 0$

16. $\frac{x}{x^2-9}$ $x = 9, x = -9$ $y = 0$

17. $\frac{7x}{x^3+1}$ $x = -1$ $y = 0$

18. $\frac{3x^2-1}{x^3}$ $x = 0$ $y =$ ~~None~~ 0 thought error

19. $\frac{6x^2+3}{x-1}$ $x = 1$ $y =$ None

20. $\frac{5x^3-4}{x^2+4x-5}$ $x = 1$ $x = -5$ ← rooten $y =$ None

21. $\frac{3x^3+30}{2x^3}$ $x = 0$ $y =$ ~~None~~ $\frac{3}{2}$ ← thought error pay attention

22. $\frac{2x^2+x-9}{3x^2-12}$ $x = 2$ $x = -2$ ← rooten $y = \frac{2}{3}$

23. $\frac{12x^4+10x-3}{3x^4}$ $x = 0$ $y = 4$

24. $\frac{13x^4+x^2}{6x+3}$ $x = -\frac{1}{2}$ $y =$ none

25. $\frac{4x^2}{x^3-x^2-2x}$ $x=2$ $x=-1$ $y=0$

GCF $x(x^2-x-2)$

Rooten → $x(x-2)(x+1)$ ← switch what rooten gives you

26. $\frac{11x}{5x^3+40}$ $x=-2$ $y=0$

Match w/ Graph

27. $\frac{x+3}{x-2}$ (b)

28. $\frac{-8}{x^2-4}$ (a)

29. $\frac{3}{x+2}$ (c) (d)

30. $\frac{x-3}{2x+4}$ (d) (c)

10.3 Multiplying + Diving Rational Expressions Notes 5/8

1. $\frac{x^2-7x-30}{x^2+x} \cdot \frac{x^2+x}{x+3}$

$\frac{x^2-7x-30}{x+3}$

$\frac{(x-10)(x+3)}{x+3}$

$x-10$

2. $\frac{x^2-49}{2x^2-14x} \cdot \frac{x^2+8x+15}{x^2+14x-21}$

$\frac{(x+7)(x-7)}{2x(x-7)} \cdot \frac{(x+3)(x+5)}{(x+7)(x-3)}$

$\frac{x+7}{2x} \cdot \frac{(x+3)(x+5)}{(x+7)(x-3)}$

$\frac{(x+3)(x+5)}{2x(x-3)}$ clear

3. $\frac{2x-3}{5x+1} \cdot \frac{15x^2-7x-2}{6x^2+13x+6}$

$\frac{(2x-3)}{(5x+1)} \cdot \frac{(5x+1)(3x-2)}{(2x-3)(3x+2)}$

try to factor

$\frac{1}{1} = 1$

how get that

-30, 10, -3, -7

$3x$ 2

$5x$ $15x^2$ $10x$

1 $-3x$ -2

not 0

4. $\frac{8x^3+27}{2x^2+3x} \div \frac{3x^3}{4x^2-6x+9}$

sum diff 2 cubs → $\frac{(2x+3)(4x^2-6x+9)}{x(2x+3)}$ ← GCF $\cdot \frac{3x^3}{4x^2-6x+9}$

$\frac{3x^3}{x} \rightarrow \boxed{3x^2}$

5. $\frac{5x^2-20}{25x^2} \div \frac{x^2+6x+8}{5x^2}$

$\frac{5x^2-20}{25x^2}$ diff $\frac{5x^2}{x^2+6x+8}$

GCF 1st then roots → $\frac{5(x^2-4)}{5} \cdot \frac{1}{(x+2)(x+4)}$

$\frac{x^2-4}{(x+2)(x+4)}$

$\frac{(x-2)(x+2)}{(x+2)(x+4)} \rightarrow \boxed{\frac{x-2}{x+4}}$

6. $\frac{x^2-3x-18}{15x^2+12x} \div \frac{2x^2+5x-3}{10x^2+3x-4}$

$\frac{x^2-3x-18}{15x^2+12x} \cdot \frac{10x^2+3x-4}{2x^2+5x-3}$

$\frac{(x-6)(x+3)}{3x(5x+4)} \cdot \frac{(5x+4)(2x-1)}{(x+3)(2x-1)}$

$\boxed{\frac{x-6}{3x}}$

$\frac{1}{1} = 1$ not 0

	$5x$	$+4$
$2x$	$10x^2$	$8x$
-1	$-5x$	-4

	x	$+3$
$2x$	$2x^2$	$6x$
-1	$-1x$	-3

10.3 Multiplying & Dividing Rational Expressions Homework 5/8

p537 13. $\frac{2x^2-10}{x+1} \cdot \frac{x-4}{4x^2-20}$ ← GCF

GCF: $\frac{2(x^2-5)}{x+1} \cdot \frac{x-4}{4(x^2-5)}$

$\frac{2(x-4)}{4(x+1)} \rightarrow$ don't distribute here

$\frac{2x-8}{4x+4}$ $\quad \frac{x+2}{2}$

$\frac{x-4}{2(x+1)}$

15. $\frac{x-3}{2x-8} \cdot \frac{6x^2-96}{x^2-9}$

factor ↓

$\frac{x-3}{2(x-4)} \cdot \frac{6(x+4)(x-4)}{(x+3)(x-3)}$

$\frac{6(x+4)(x-4)}{2(x-4)(x+3)}$ $\quad \frac{3(x+4)}{x+3}$

w/ rooten switch signs when putting it like this

17. $\frac{x^2+6x-7}{x^4+8x^3+7x^2} \cdot \frac{3x^2}{1}$

$\frac{(x-1)(x+7)}{x^2(x^2+8x+7)} \cdot \frac{3x^2}{1}$

$\frac{(x-1)(x+7)}{(x+1)(x+7)} \cdot \frac{3x^2}{1}$

$\frac{(x-1)(3x^2)}{(x+1)} \rightarrow \frac{3(x-1)}{x+1}$

19. $\frac{(x^2+8x+16)}{1} \cdot \frac{16x^2-64}{x^2-16}$ ← do GCF 1st

$\frac{(x+4)(x+4)}{1} \cdot \frac{16(x+2)(x-2)}{(x+4)(x-4)}$

$\frac{16(x+4)(x+2)(x-2)}{(x+4)} \; x^2-4$ $\quad \frac{16(x+4)(x^2-4)}{x-4}$

10.3 Dividing Rational Expressions Homework

5/9

p537 21. $\frac{x^2+4x-5}{2x^2} \div \frac{x-1}{4x}$

$\frac{x^2+4-5}{2x^2} \cdot \frac{4x}{x-1}$

$\frac{(x-1)(x+5)}{2x^2} \cdot \frac{4x}{x-1}$

$\frac{x+5(4x)}{2x^2}$ $\div 2x$

$\frac{(x+5)\,2x}{x}$ → $\frac{2(x+5)}{x}$

23. $\frac{x^2+8x+16}{x+2} \div \frac{x^2+6x+8}{x^2-4}$

$\frac{x^2+8x+16}{x+2} \cdot \frac{x^2-4}{x^2+6x+8}$

$\frac{(x+4)(x+4)}{x+2} \cdot \frac{(x+2)(x-2)}{(x+2)(x+4)}$

$\frac{(x+4)(x-2)}{(x+2)}$

25. $\frac{x-3}{x^2-5x-14} \div \frac{x^2-x-6}{x-7}$

$\frac{x-3}{x^2-5x-14} \cdot \frac{x-7}{x^2-x-6}$

$\frac{x-3}{(x-7)(x+2)} \cdot \frac{x-7}{(x-3)(x+2)}$

$\frac{1}{(x+2)^2}$

27. $\frac{x^2+10x+24}{3x^2+3x} \div \frac{x+6}{1}$

$\frac{x^2+10x+24}{3x^2+3x} \cdot \frac{1}{x+6}$

$\frac{(x+4)(x+6)}{3x(x+1)} \cdot \frac{1}{x+6}$

$\frac{x+4}{3x(x+1)}$

29. $\frac{x+4}{1} \div \frac{x^2-6x-40}{x^2+3x}$

$\frac{x+4}{1} \cdot \frac{x^2+3x}{x^2-6x-40}$

$\frac{x+4}{1} \cdot \frac{(x)(x+3)}{(x-10)(x+4)}$

$\frac{x(x+3)}{x-10}$

31. $\frac{x^2+10x+25}{1} \div \frac{x^2+12x+35}{x^2-8x-105}$

$\frac{x^2+10x+25}{1} \cdot \frac{x^2-8x-105}{x^2+12x+35}$

$\frac{(x+5)(x+5)}{1} \cdot \frac{(x-15)(x+7)}{(x+5)(x+7)}$

$(x+5)(x-15)$

30.

38. $\frac{x^2-5x-14}{x^3-6x^2-7x} \cdot \frac{x^2-4x-5}{1} \div \frac{x^2+x-30}{2x}$

$\frac{x^2-5x-14}{x(x^2-6x-7)} \cdot \frac{x^2-4x-5}{1} \cdot \frac{2x}{x^2+x-30}$

$\frac{(x-7)(x+2)}{x(x-7)(x+1)} \cdot \frac{(x-5)(x+1)}{1} \cdot \frac{2x}{(x-5)(x+6)}$

$\frac{(x+2)}{x} \cdot \frac{2x}{(x+6)}$

$\frac{2(x+2)}{(x+6)}$

$2x/x = 2$ not x

10.5 Adding + Subtracting Rational Expressions + Complex Fractors

5/9

* Key: Get Common Denominators

1. $\frac{x}{16} + \frac{x}{15}$ → lowest common denominator

$\frac{3x}{30} + \frac{2x}{30}$

$\frac{3x+2x}{30}$

2. $\frac{x}{4} + \frac{y}{12}$

$\frac{3x}{4} + \frac{y}{12}$

3. $\frac{x}{8} + \frac{y}{20}$

$\frac{5x}{40} + \frac{2y}{40}$

4. $\frac{x}{5a} + \frac{y}{a^2b}$

$\frac{?x}{5a^2b} + \frac{?y}{5a^2b}$

5. $\frac{?}{7x^2y} + \frac{?}{14xy^2}$

$\frac{?}{14x^2y^2} + \frac{?}{14x^2y^2}$

1. $\frac{-6}{xy} + \frac{9}{x}$

$\frac{-6}{xy} + \frac{9(y)}{xy}$

$\frac{-6+9y}{xy}$

CF $\frac{3(-2+3y)}{xy}$

10.5 Adding + Subtracting (Rational) Expressions + (Complex Fractions) 5/9

2. $\frac{4}{2x^2} + \frac{1}{3x}$

$\frac{4(3)}{6x^2} + \frac{1(2x)}{6x^2}$

$\frac{12}{6x^2} + \frac{2x}{6x^2}$

$\frac{12+2x}{6x^2}$ → factor $\frac{2(6+x)}{6x^2}$ → $\frac{(6+x)}{3x^2}$

3. $\frac{11}{3(x-5)} - \frac{x+1}{3x}$

$\frac{11(x)}{3x(x-5)} - \frac{x+1(x-5)}{3x(x-5)}$

$\frac{11x - (x+1)(x-5)}{3x(x-5)}$

$\frac{11x - (x^2 - 4x - 5)}{3x(x-5)}$ ← distribute

$\frac{11x - x^2 + 4x + 5}{3x(x-5)}$

$\frac{-x^2 + 15x + 5}{3x(x-5)}$ ← leave

Diff. factorable

$-5 \times 3x$

$15 \quad 11$

Can't factor

4. $\frac{5}{2} - \frac{3x}{(x+1)}$

$\frac{5(x+1)}{2(x+1)} - \frac{3x(2)}{2(x+1)}$

$\frac{5(x+1) - 6x}{2(x+1)}$

$\frac{5x+5-6x}{2x+2}$ ← don't have to distribute

$\frac{-x+5}{2x+2}$

5. $\frac{3}{(x+2)} - \frac{8}{(x-2)}$

$\frac{3(x-2)}{(x+2)(x-2)} - \frac{8(x+2)}{(x+2)(x-2)}$

$\frac{3x-6-8x-16}{x^2-4}$

$\frac{-5x-22}{x^2-4}$

6. $\frac{(x+1)}{(x-2)(x-7)} - \frac{2x+1}{(x-7)}$ ← multiply whole thing

copy error $\frac{(x+1)}{(x-2)(x-7)} - \frac{(2x+1)(x-2)}{(x-7)(x-2)}$ distribute negative

$\frac{(x+1) - (2x^2-4x+x-2)}{(x-2)(x-7)}$ $-3x$

$\frac{-2x^2+4x+3}{(x-2)(x-7)}$ ← don't factor

$x+1-2x^2+3x+2$

7. $\frac{x-2}{x+5} + \frac{23x+3}{x^2-6x-55}$

$\frac{x-2}{x+5} + \frac{23x+3}{(x+5)(x-11)}$

$\frac{(x-2)(x-11)}{(x+5)(x-11)} + \frac{23x+3}{(x+5)(x-11)}$

$\frac{x^2-13x+22 + 23x+3}{x^2-6x-55}$

$\frac{x^2+10x+25}{(x+5)(x-11)}$

$\frac{(x+5)(x+5)}{(x+5)(x-11)}$

$\frac{(x+5)}{(x-11)}$

-11
+22

10.5

Complex Fraction Notes

5/11

- Complex fractions - consist of adding/subtracting terms + then dividing

1. $\dfrac{\frac{x}{4}+\frac{3}{2}}{2-\frac{3}{x}}$ ← simplify here 1st ← and here

$\dfrac{\frac{x}{4}+\frac{3}{2}}{\left(\frac{1}{2}-\frac{x}{3}\right)}$

$\left(\frac{x}{4}+\frac{6}{4}\right) \div \left(\frac{3}{6}-\frac{2x}{6}\right)$

$\frac{6+x}{4} \div \frac{3-2x}{6}$ ← then multiply

$\frac{6+x}{4} \cdot \frac{6}{3-2x}$

$\frac{6(6+x)}{4(3-2x)}$

$\frac{36+6x}{12-8x}$

not the right way to do it

$\frac{18+12x+3x-2x^2}{24}$

$\frac{-2x^2-9x+18}{24}$

2. $\dfrac{\frac{1}{3x}-\frac{4}{x+2}}{\frac{x}{x+2}+\frac{1}{x}}$

$\dfrac{\frac{1(x+2)-4(3x)}{(3x)(x+2)}}{\frac{x^2+1(x+2)}{(x+2)(x)}}$ ← copy error

$\dfrac{\frac{x+2-12x}{(3x)(x+2)}}{\frac{x^2+x+2}{(x+2)(x)}}$ ← distrib. factor now

$\dfrac{\frac{-11x+2}{(3x)(x+2)}}{\frac{-(x-2)(x+1)}{(x+2)(x)}}$

$\frac{-11x+2}{(3x)(x+2)} \cdot \frac{(x+2)(x)}{-(x-2)(x+1)}$

$\frac{-11x+2}{3(x-2)(x+1)}$

x^2+x+2

$3(x^2+x+2)$

Complex Fraction Notes

3. $\dfrac{\dfrac{2}{3x+15}}{\dfrac{2}{x+5}+\dfrac{1}{4x+20}}$ $\quad$ $\dfrac{\dfrac{2}{3x+15}}{\dfrac{2(4)}{x+5(4)}+\dfrac{1}{4x+20}}$ $\quad$ $\dfrac{\dfrac{2}{3x+15}}{\dfrac{8+1}{4x+20}}$

$\dfrac{2}{3x+15} \cdot \dfrac{4x+20}{9}$ $\quad$ $\dfrac{2 \cdot 4}{3 \cdot 9}$ $\quad$ $\dfrac{8}{27}$

10.5 Addition, Subtraction, and Complex Fractions Homework 5/11

p551 19. $\frac{-4x^2+2}{x^2+9x-10} + \frac{3}{x+10}$

$\frac{-4x^2+2}{(x-1)(x+10)} + \frac{3(x-1)}{x+10(x-1)}$

✓ $\frac{-4x^2+2+3x-3}{(x-1)(x+10)}$

$\frac{-4x^2+3x-1}{(x-1)(x+10)}$

21. $\frac{3-4x}{x^2+3x-10} - \frac{2}{x+5}$

$\frac{3-4x}{(x-2)(x+5)} - \frac{2}{x+5}$

$\frac{3-4x}{(x-2)(x+5)} - \frac{2(x-2)}{(x+5)(x-2)}$

✓ $\frac{3-4x-2(x-2)}{(x-2)(x+5)}$

$\frac{3-4x-2x+4}{(x-2)(x+5)}$

$\frac{-6x+7}{(x-2)(x+5)}$

11. $\frac{4x+1}{x^2-4} - \frac{3}{x-2}$

✓ $\frac{4x+1}{(x+2)(x-2)} - \frac{3(x+2)}{(x-2)(x+2)}$

$\frac{(4x+1)-3(x+2)}{(x+2)(x-2)}$ →

$\frac{4x+1-3x-6}{(x+2)(x-2)}$

$\frac{x-5}{(x+2)(x-2)}$

13. $\frac{3x^2}{x^2-x-30} - \frac{3x+5}{x-6}$

$\frac{3x^2}{(x-6)(x+5)} - \frac{3x+5}{(x-6)(x+5)}(x+5)$

$\frac{(3x^2)-(3x+5)\times(x+5)}{(x-6)(x+5)}$ Multiplication 1st - Foil now

$\frac{(3x^2)-(3x^2+15x+5x+25)}{(x-6)(x+5)}$

$\frac{3x^2-3x^2-20x-25}{(x-6)(x+5)}$

$\frac{-20x-25}{(x-6)(x+5)}$

15. $\frac{12x^2-x+9}{3x+33} - \frac{16}{x+11}$

$\frac{12x^2-x+9}{3x+33} - \frac{16(3)}{x+11(3)}$

$\frac{12x^2-x+9-48}{3x+33}$

$\frac{12x^2-x-39}{3x+33}$

16. $\frac{1-3x}{x-6} + \frac{2}{2x+1}$

$\frac{1-3x(2x+1)}{(x-6)(2x+1)} + \frac{2(x-6)}{(x-6)(2x+1)}$

$\frac{(1-3x)(2x+1)+2x-12}{(x-6)(2x+1)}$

$\frac{(2x+1-6x^2-3x)+2x-17}{(x-6)(2x+1)}$

$\frac{(6x^2-x+1))+2x-12}{(x-6)(2x+1)}$

$\frac{6x^2+x-11}{(x-6)(2x+1)}$

23. $\dfrac{\frac{x}{3}-4}{5+\frac{1}{x}} \rightarrow \dfrac{\frac{x}{3}-\frac{12}{3}}{\frac{5x}{x}+\frac{1}{x}} \rightarrow \dfrac{\frac{x-12}{3}}{\frac{5x+1}{x}} \rightarrow \dfrac{x-12}{3} \cdot \dfrac{x}{5x+1}$

$\dfrac{x(x-12)}{3(5x+1)}$

27. $\dfrac{\frac{10}{x+1}}{\frac{1}{2}+\frac{3}{x+1}} \rightarrow \dfrac{\frac{10}{x+1}}{\frac{1(x+1)}{2(x+1)}+\frac{3(2)}{(x+1)(2)}} \rightarrow \dfrac{\frac{10}{x+1}}{\frac{x+1+6}{2(x+1)}}$

$\dfrac{10}{x+1} \cdot \dfrac{2(x+1)}{x+7} \quad \dfrac{10 \cdot 2}{x+7} \quad \dfrac{20}{x+7}$

31. $\dfrac{\frac{1}{x+1}+\frac{1}{2}}{\frac{3}{2x^2+4x+2}} \rightarrow \dfrac{\frac{1(2)}{x+1(2)}+\frac{1(x+1)}{2(x+1)}}{\frac{3}{2(x+1)(x+1)}}$

GCF 1st → Then Reduce

$\dfrac{(2+x+1)}{2(x+1)} \cdot \dfrac{2(x+1)(x+1)}{3} \rightarrow \dfrac{(3+x)(x+1)}{3}$

10.4 Rational Solving Equations

Notes 5/14

- goal: to solve for x

1. $\frac{2}{x} + \frac{5}{3} = \frac{7}{x}$

$\frac{2(3)}{x(3)} + \frac{5(x)}{3(x)} = \frac{7(3)}{x(3)}$ ← if all same denom - can ignore it + work on just numerator

$\frac{6+5x}{3x} = \frac{21}{3x}$

$6+5x = 21$

$-6 \quad -6$

$\frac{5x}{5} = \frac{15}{5}$

$x = 3$

Extraneous solution occurs when the value found by solving an equation creates a false statement

↑ check every problem for this

← extraneous solution

← can also be any false statement

2. $\frac{5x}{x-2} = 7 + \frac{10}{x-2}$

$\frac{5x}{x-2} = \frac{7(x-2)}{x-2} + \frac{10}{x-2}$

$5x = 7x - 14 + 10$

$5x = 7x - 4$

$-7x \quad -7x$

$\frac{-2x}{-2} = \frac{-4}{-2}$ ← check

$x = 2$

↑ Divide by 0 error. Divide on both sides

Solving Equations
Notes

3. $\frac{2}{x-2} - \frac{x}{x-2} + \frac{6}{x^2+3x-10}$

$\frac{2}{x-2} - \frac{x}{x-2} + \frac{6}{(x-2)(x+5)}$

$\frac{2(x+5)}{x-2(x+5)} = \frac{x(x+5)}{(x-2)(x+5)} + \frac{6}{(x-2)(x+5)}$

$2x+10 = x^2+5x+6$

$-2x+10 = (x+2)(x+3)$ not yet

$-2x \quad -10 \qquad -2x \quad -10$

$0 = x^2+3x-4$

$(x-1)(x+4)$

$x=1$
$x=-4$ } check ✓'s (including for extraneous)

4. $\left(\frac{7x+1}{2x+5} + 1\right) = \frac{10x-3}{3x}$ copy/thought error

$\frac{7x+1(3x)}{2x+5(3x)} + \frac{1(2x+5)(3x)}{(2x+5)(3x)} = \frac{10x-3(2x+5)}{3x(2x+5)}$

$7x+1(3x) + (2x+5)(3x) = (10x-3)(2x+5)$

$21x^2+3x+6x^2+15x = 20x^2+50x-6x-15$

$27x^2+18x = 20x^2+44x-15$

$-27x^2 \quad -18x \qquad -27x^2 \quad -18x$

$0 = -7x^2+26x-15$

$x = \frac{5}{7}, 3$

✓: ✓ ✓

10.4 Solving Rational Equations Homework 5/14

25. $\frac{10}{x+3} + \frac{10}{3} = 6$

$\frac{10(3)}{3(x+3)} + \frac{10(x+3)}{3(x+3)} = \frac{18(x+3)}{3(x+3)}$

$30 + 10x + 30 = 18x + 54$

$-20 \qquad -20$

$10x = 8x + 54$

$-10x \quad -10x$

$0 = 8x + 54$

$-54 \quad -54$

$\frac{-54}{8} = \frac{8x}{8}$

$-\frac{27}{4} = x$ ✓

legal move?

$x = 6x - 2$

$-x \quad -x$

$0 = 5x - 2$ ← get = to 0

$+2 \quad +2$

$\frac{2}{5} = \frac{5x}{5}$ ← find roots

$x = \frac{2}{5}$ ✗ why?

28. $\frac{x}{2x+7} = \frac{x-5}{x-1}$

$\frac{x(x-1)}{(2x+7)(x-1)} = \frac{(x-5)(2x+7)}{(x-1)(2x+7)}$

$x^2 - x = 2x^2 + 7x - 10x - 35$

$-x^2 + x \quad -x^2 + x$

$0 = x^2 - 2x - 35$

$x = 7, -5$ → v'it! ✓ ✓

29. $\frac{6x}{x+4} + 4 = \frac{2x+2}{x-1}$

foil all of that

$\frac{6x(x-1)}{(x+4)(x-1)} + \frac{4(x+4)(x-1)}{(x+4)(x-1)} = \frac{(2x+2)(x+4)}{(x-1)(x+4)}$

$6x^2 - 6x + (4x+16)(x-1) = 2x^2 + 10x + 8$

$6x^2 - 6x - 4x^2 - 4x + 16x - 16 = 4x + 8$

$6x^2 - 6x + 6x - 16 = 4x + 8$

$-4x \quad -8 \quad -4x + 8$

$10x^2 - 2x - 24 = 0$

$x = -\frac{3}{2}, 2$

?? wrong ans

33. $\frac{10}{x^2-2x} + \frac{4}{x} = \frac{5}{x-2}$

$\frac{10}{(x-2)(x)} + \frac{4}{x} = \frac{5}{x-2}$

$\frac{10}{(x-2)(x)} + \frac{4(x-2)}{x(x-2)} = \frac{5(x)}{x-2(x)}$

$10 + 4x - 8 = 5x$

$-5x \quad -5x$

$-x + 2 = 0$

$2 = x$

✓. No solution - extranious

35. $\frac{2}{6x+5} - \frac{3}{4(6x+5)} = \frac{1}{28}$

$\frac{2(28)}{28(6x+5)} - \frac{3(7)}{28(6x+5)} = \frac{6x+5}{28(6x+5)}$

$56 - 21 = 6x + 5$

$-5 \quad -5$

$30 = 6x$

$\frac{30}{6} = \frac{6x}{6}$

$x = 5$

✓. ✓

next sheet

38. $\frac{8(x-1)}{x^2-4} = \frac{4}{x-2}$

$\frac{8(x-1)}{(x-2)(x+2)} = \frac{4}{(x-2)}$

$\frac{8(x-1)}{(x-2)(x+2)} = \frac{4(x+2)}{(x-2)(x+2)}$

$8(x-1) = 4(x+2)$

$8x-8 = 4x+8$

$-4x-8 \quad -4x-8$

$4x-16 = 0$

$+16 \quad +16$

$\frac{4x}{4} = \frac{16}{4}$

$x = 4$ ✓

42. $\frac{6}{x-1} + \frac{2x}{x-2} = 2$ — copy problem wrong

$\frac{6(x-2)}{(x-1)(x-2)} + \frac{2x(x-1)}{(x-2)(x-1)} = \frac{2(x-2)(x-1)}{(x-2)(x-1)}$

$6x-12+2x^2-2x = (2x-4)(x-1)$

~~$8x-14 = 2x^2-2x-4x+4$~~

$-8x \quad +14 \qquad -8x \quad +14$

$0 = 2x^2-14x+18$

weird ans - did it wrong;

$x = \frac{8}{5}$

5/17

Quiz

5/16

Section 10.1 - Asymptotes (Calc then calc section)

vertical - denom = to 0, solve for x (x=?)

horizontal - degree { denom > y=0 ↑ zero ↑ ; num > y= none ; = y= ratio of largest power co-efficient

10.3

Multiplying + Diving Rational

10.5

Adding + Subtracting Rational

10.4

Solving Equations

extraneous ?

Alphabet Soup

A. $\frac{2x+1}{x+3} - \frac{x+4}{x-5}$

B. $\frac{5}{x} - \frac{x}{3} + \frac{1}{x-1}$

C. $\frac{1}{x} - 4$

D. $\frac{5}{3} + \frac{3}{2x}$

E. $\frac{18}{2(x+1)} - \frac{5}{2x}$

F. $\frac{x}{x-5} - \frac{32}{x^2-3x-10}$

G. $\frac{2x}{2x-2} - \frac{x}{2}$

H. $\frac{1}{x+10} + \frac{x+10}{1}$

I. $16 - \frac{1}{x^2}$

J. $\frac{4x-1}{x^2+3x+2} + \frac{x-4}{x+2}$

K. $\frac{2005}{20-x} + \frac{1990}{x}$

L. $\frac{2x-9}{x} - \frac{9-2x}{x^2}$

M. $\frac{5}{x-6} + \frac{2x-1}{x(x-6)}$

N. $\frac{x+5}{x-2} - \frac{x}{x-6}$

O. $\frac{-5}{x-2} + \frac{5}{x-1} - \frac{5}{x}$

P. $\frac{10}{x^2+3x} - \frac{x+4}{x+3}$

Q. $\frac{3x}{x+1} + \frac{12}{x^2-1}$

R. $\frac{1}{x^2+6x+8} + \frac{2}{x^2+7x+12}$

S. $25 - \frac{x+5}{x-5}$

T. $\frac{x+5}{x-5} - 25$

U. $25 + \frac{x+5}{x-5}$

V. $\frac{4}{3} + \frac{3}{2x} - \frac{4}{3x}$

W. $\frac{7}{x+3} - \frac{4}{x} + \frac{x}{4}$

X. $\frac{2x+1}{x+3} - \frac{x}{6} + \frac{1}{4}$

Y. $\frac{x}{x+8} + \frac{x+8}{x}$

Z. $\frac{x}{x+8} - \frac{x+8}{x}$

Rules:

- I am thinking of an 11-letter word that uses 7 of these letters only once, and 2 of these letters twice.
- Everyone will start with the letter M, which is in the word once.
- Submit your answer to M. If it is correct, you will get another letter in the word.
- This letter will tell you which problem to do next, so you can get your next clue.
- **You are only allowed one guess at the word**. An incorrect guess means you must do a problem without receiving a clue.

_ _ _ _ _ _ _ _ _ _ _ *letters you know*: M,

A. $\frac{2x+1}{x+3} - \frac{x+4}{x-5}$ — don't say LCD

$\frac{(2x+1)(x-5)}{(x+3)(x-5)} - \frac{(x+4)(x+3)}{(x+3)(x-5)}$

foil

not distribute

$2x^2 - 10x + x - 5 - (x^2 + 3x + 4x + 12)$

~~$x^2 - 2x + 1$~~ ⊖ ⇐ remember

$2x^2 - 10x + x - 5 - x^2 - 3x - 4x - 12$

$x^2 - 16x - 17$

$x = 17$

$x = -1$

B. $\frac{5}{x} - \frac{x}{3} + \frac{1}{x-1}$

$\frac{5}{3(x)(x-1)}$

C. $\frac{1}{x} - 4$

$\frac{1}{x} - \frac{4x}{x}$

$\frac{1-4x}{x}$

Solving Radical Equations Notes

5/18

Goal - to get x by itself & find its value

1. $3x^2 - 23 = 25$

$+23 \quad +23$

$\frac{3x^2}{3} = \frac{48}{3}$

$x^2 = 16$

$\sqrt{\ } \quad \sqrt{\ }$

$|x = 4|, |x = -4|$ $\rightarrow \sqrt[2]{x^2} = x^{\frac{2}{2}} = x^1$

$a^{\frac{m}{n}} = \sqrt[n]{a^m}$

2. $\sqrt[3]{x} - 2 = 0$

$+2 \quad +2$

$\sqrt[3]{x} = 2$

$\wedge^3 \quad \wedge^3$

$x = 2^3$

$x = 8$

* extraneous solutions are still a possibility!

3. $x^{\frac{3}{2}} = 27$

$\sqrt{x^3} = 27$

$\wedge^2 \quad \wedge^2$

$x^3 = 729$

$\sqrt[3]{\ } \quad \sqrt[3]{\ }$

$x = 9$ ✓ for extraneous

$9^{\frac{3}{2}}$

$\sqrt{9^3}$

3^3

27 ✓

4. $\sqrt{3x-8} + 1 = 3$

$-1 \quad -1$

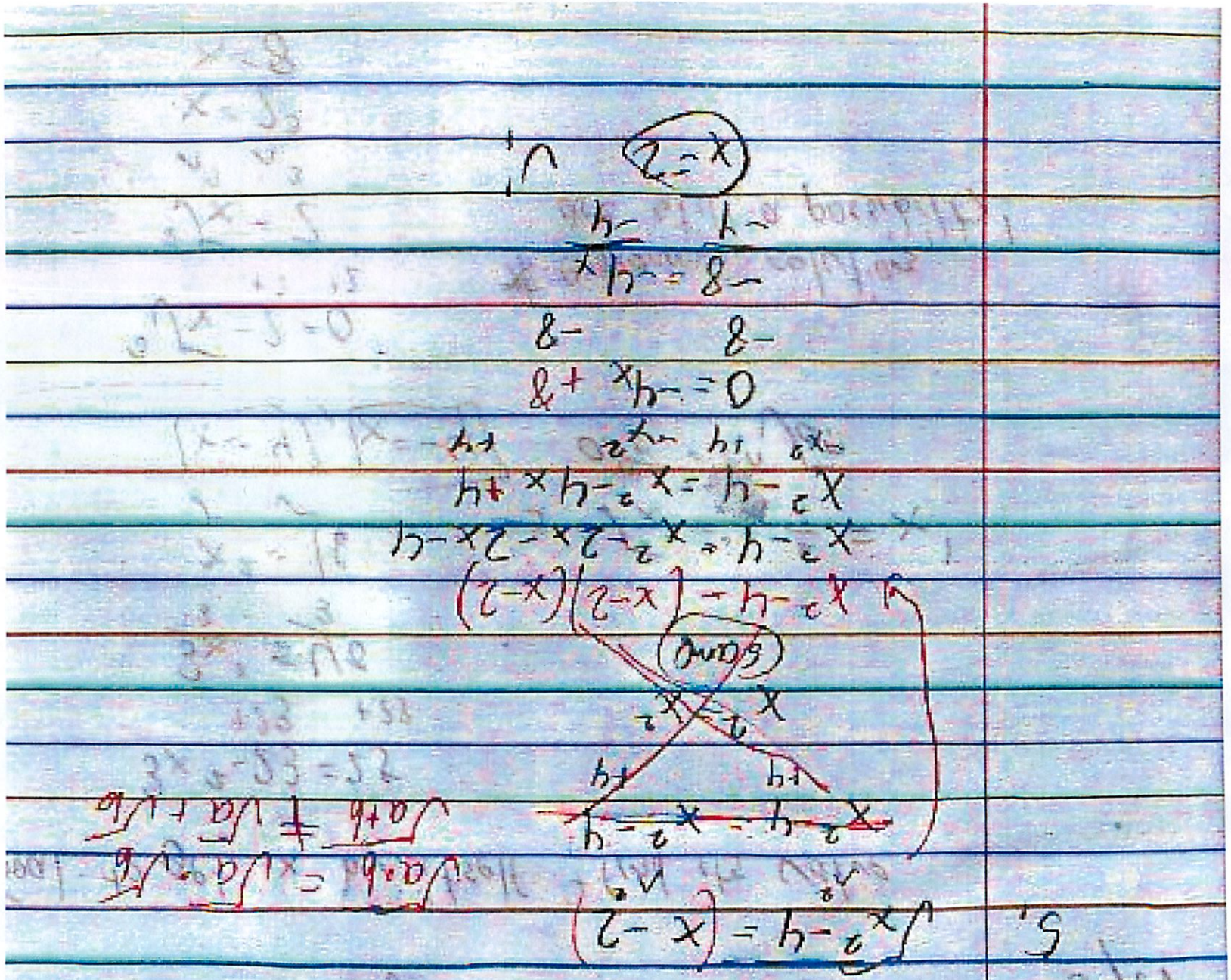
$\sqrt{3x-8} = 2$

$\wedge^2 \quad \wedge^2$

$3x - 8 = 4$

$+8 \quad +8$

$\frac{3x}{3} = \frac{12}{3} \rightarrow (x = 4)$ ✓ extraneous



World of Functions Unit

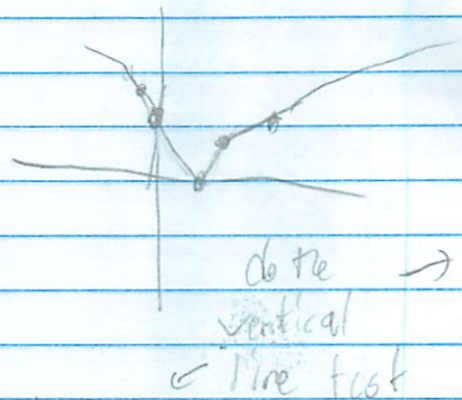
Inital Notes

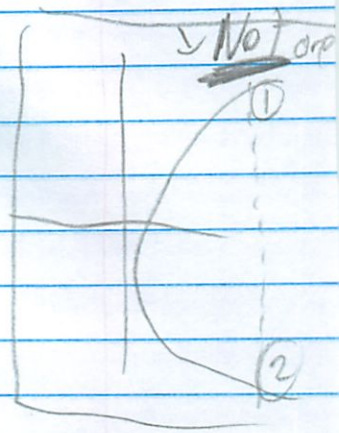
5/16

function - a set of ordered pairs (x, y) which satisfies this condition

~~*~~ for every x-value - there is 1 and only 1 y value

x	y
-1	6
0	4
1	8
2	3
4	4





Vertical line test - if a vertical line is drawn through the graph of an equation, then the line is not a function (it touches > 1 point)

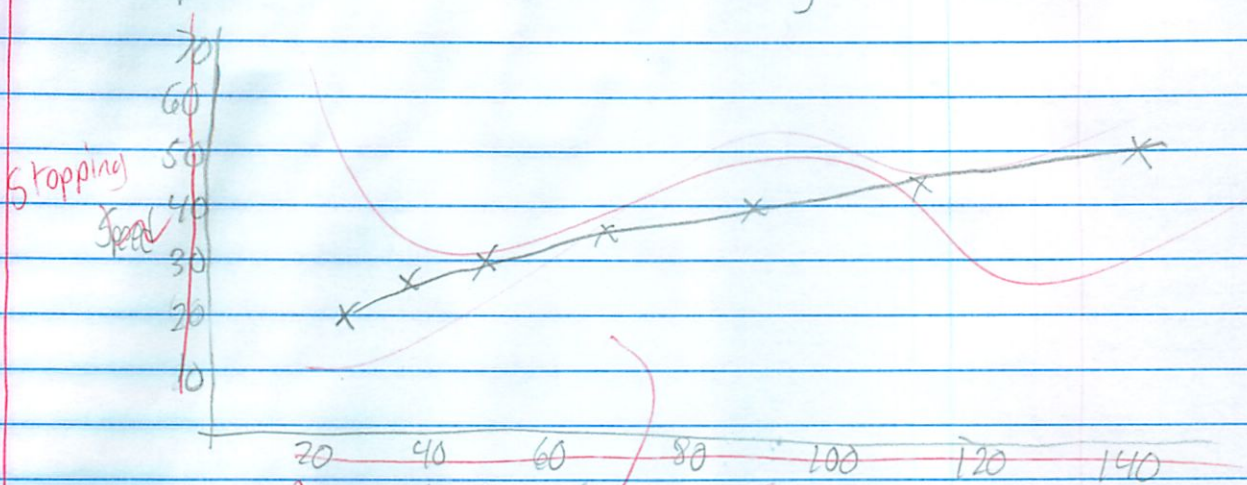
domain - the xs (inputs) - independent variables

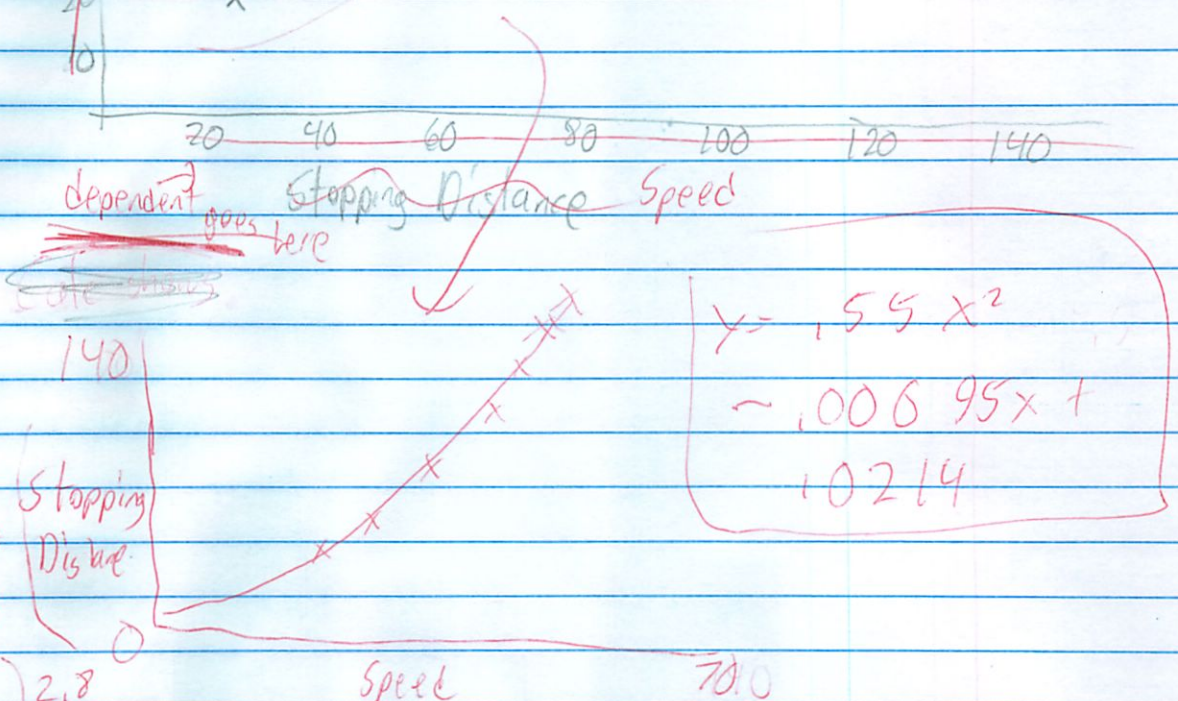
range - the ys (outputs) - dependent variables

Brake p258

5/16

The stopping distance is a function of the speed the car is traveling





$y = .55x^2 - .00695x + .0214$

x	y		
20	22.4	12.5	
25	34.7	15.3	
30	50	18	2.8
35	68	20.8	2.8
40	88.8	23.6	2.8
45	112.4	26.4	2.8
50	138.8		

diff of diff is the same

It's a parabolic function
As it goes faster marginal stoping distance ↑

At 70mph it will take about 272.02 ft to stop using the above formula (function)

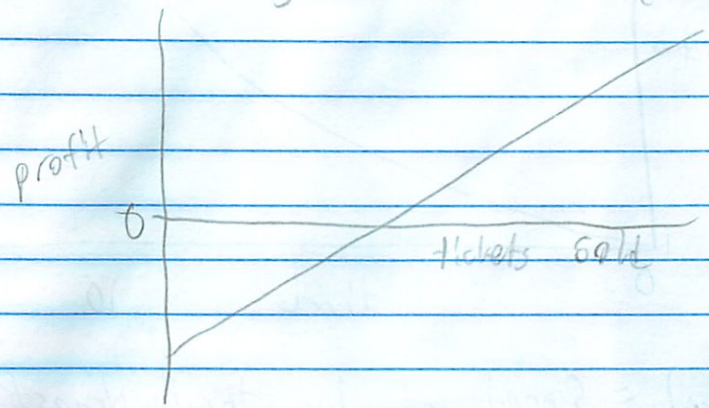
If you 2x the speed, you 4 the stopping distance

Story Sketches (1)

5/17

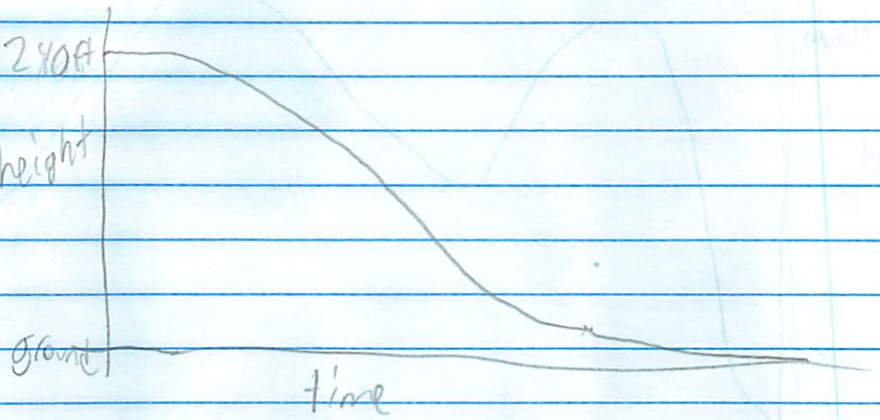
Graph several situations

1. Students putting on a show, f(# tickets) = profit

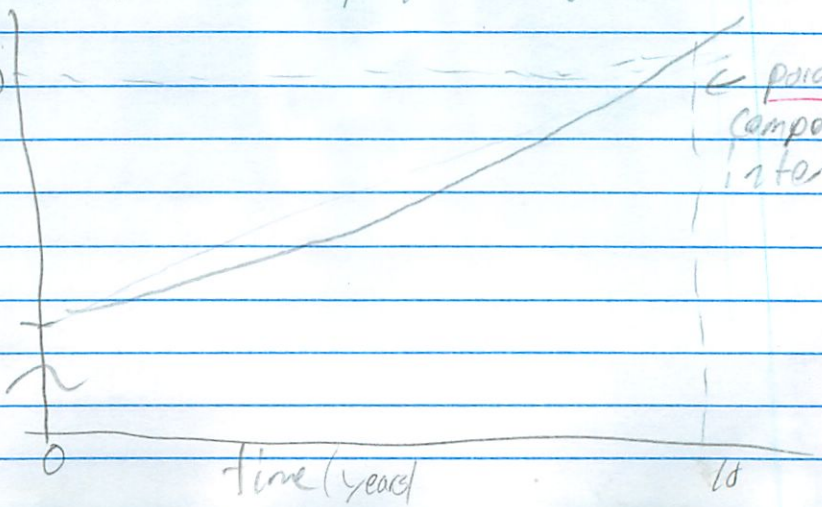


Marginal cost per ticket does not increase

2. Ride down an elevator f(time) = height off ground



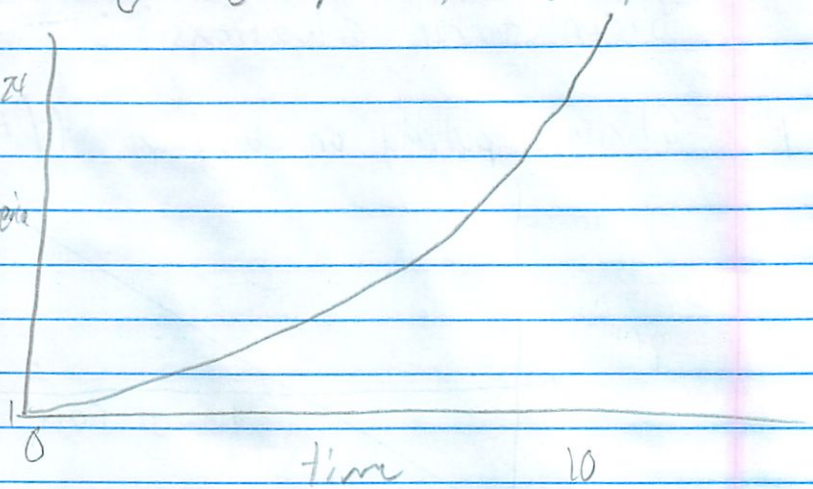
3. $1000 in savings at 4% year f(time) = $ in account



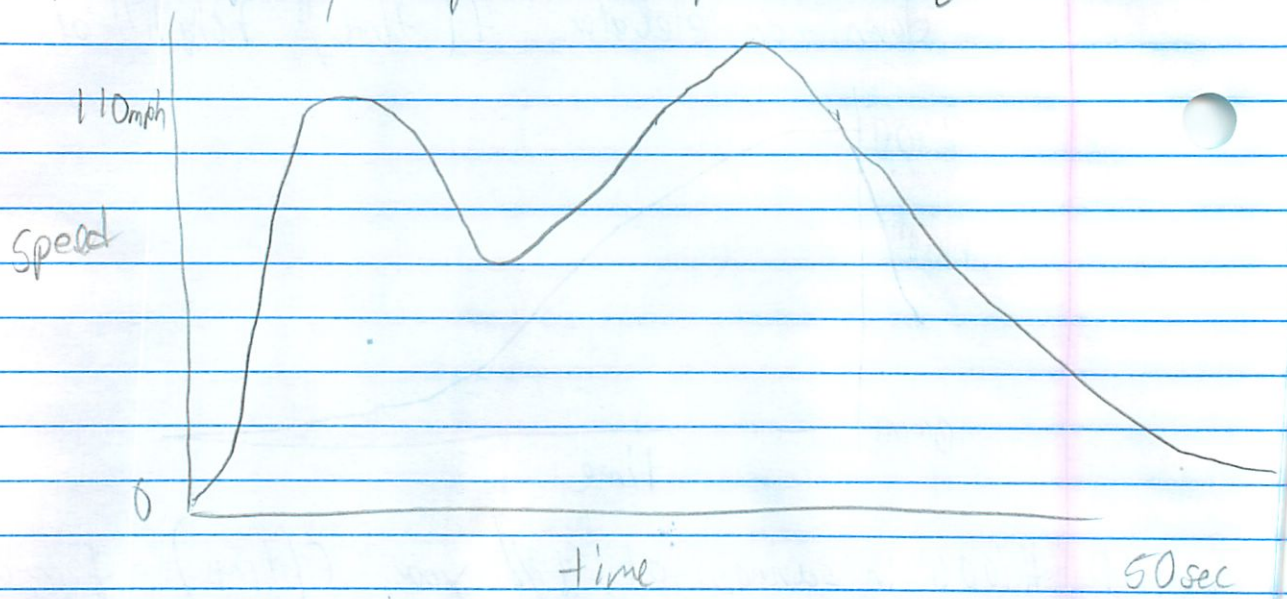
parabolic b/c compounding interest

4. Colony of bacteria growing exponetaly f(time) = bacteria

time	bacteria
0	1
1	2
2	4
3	8
10	1024



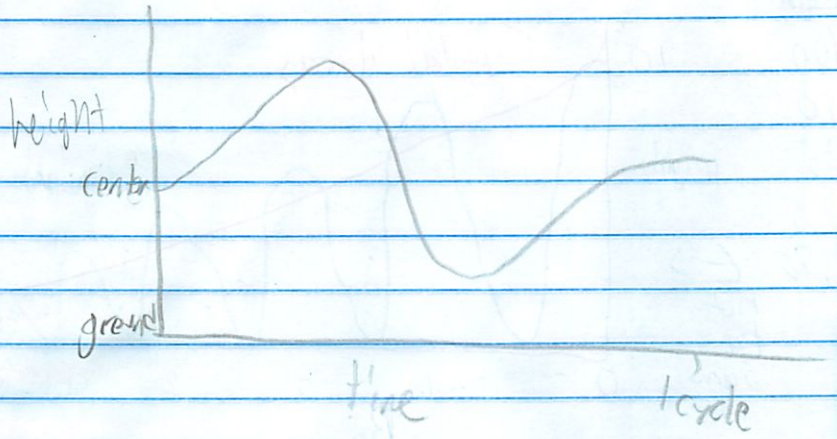
5 My own: f(time) = Speed of Top thrill dragstor



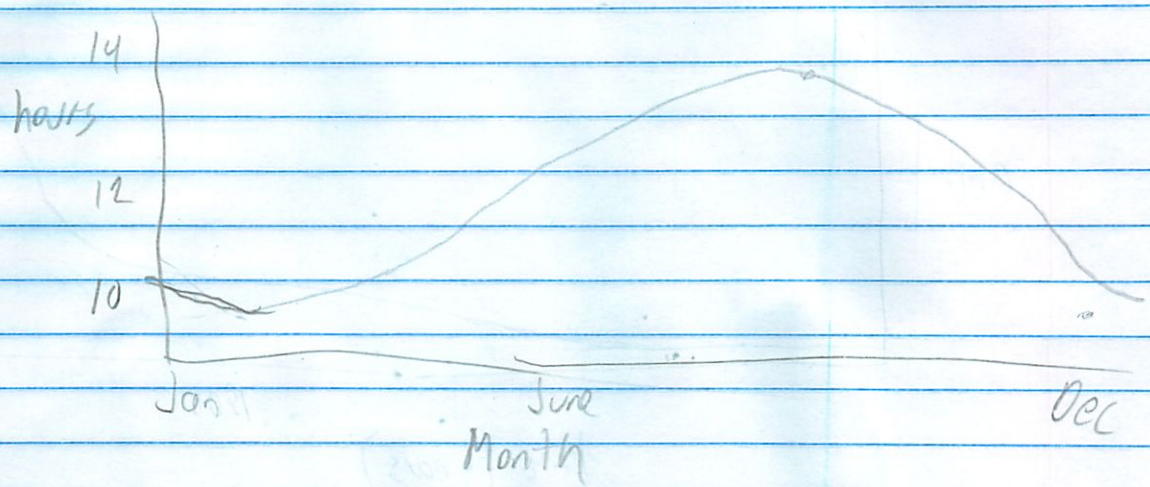
More Story Sketches (2)

5/17

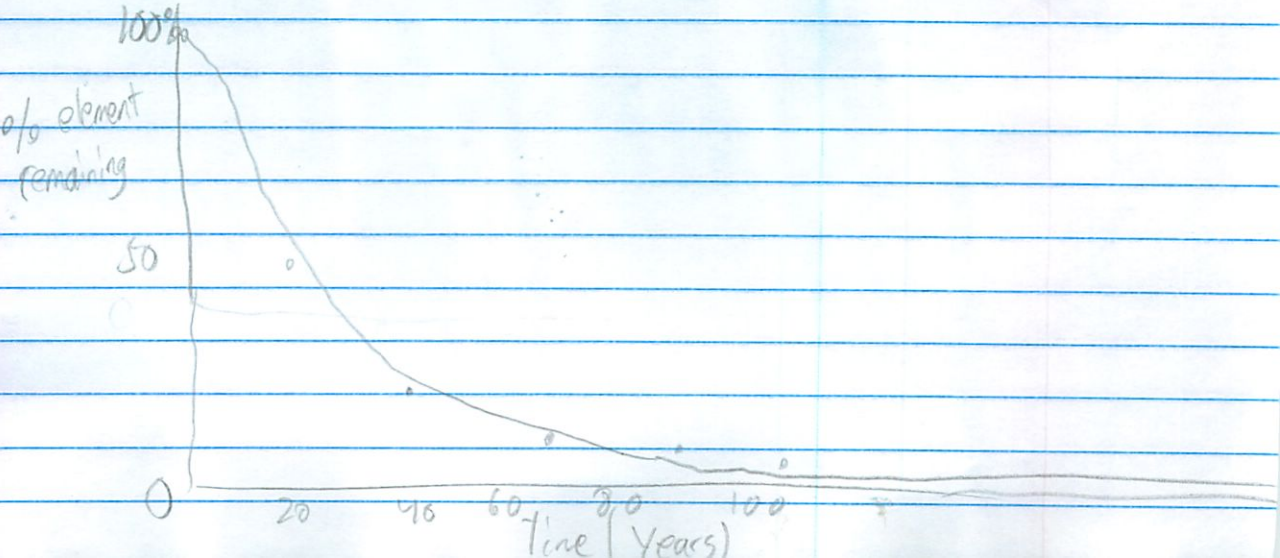
1. Riding on a ferris wheel height = f(time)



2. hours of sunlight = f(days in a year)



3. Element has half-life of 20 years

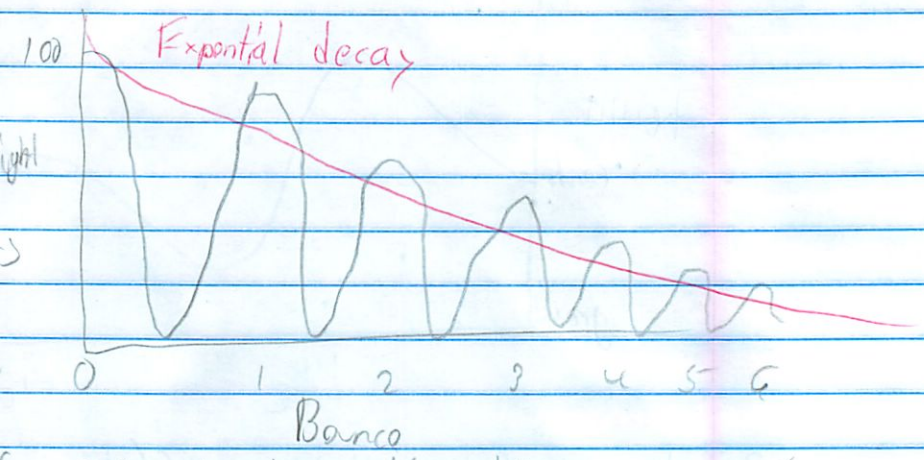


Bouncy

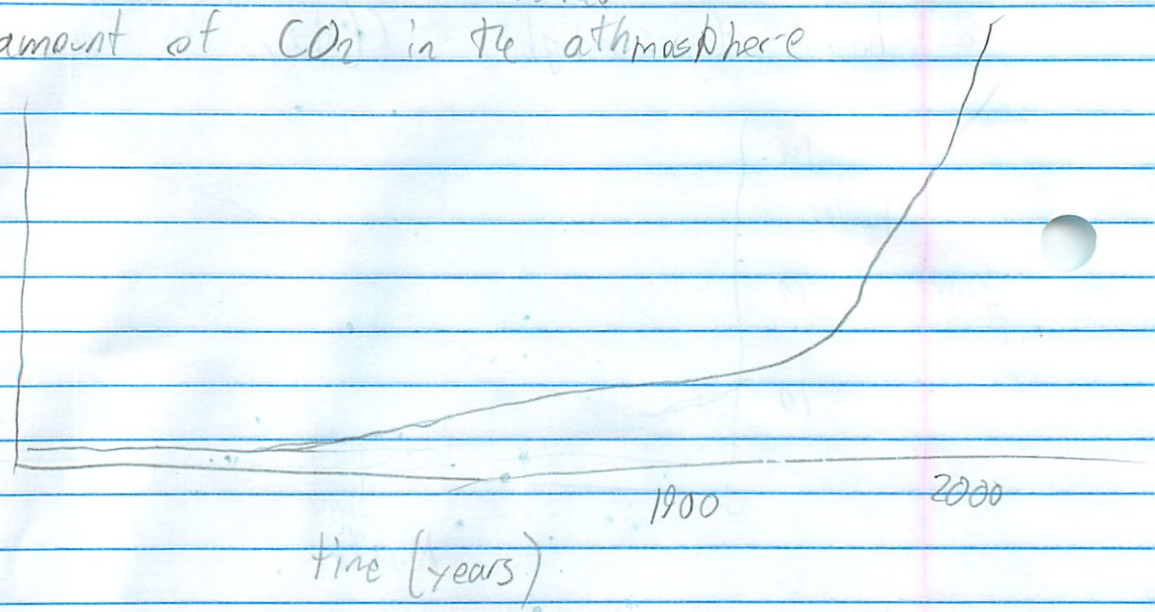
4. Ball dropped height = f(time)

bounce	height
1	100
2	50
3	25
4	12.5
5	6.25

↔ not the same



5. The amount of CO_2 in the athmosphere



IAG 4
HOT SHEET

Name Michael Plasmeier
Date 5/16
Unit Functions

Linear Function

The set of functions whose graphs are straight lines - represented by $y = mx + b$ (m: slope, b: y-intercept)

Exponential Growth Function

The set of functions in which the y-values of the function increase by the same fixed factor whenever x increases by a given amt. $= y = a \cdot b^x$ ← exponent
(a: initial amt, b: multiplying factor, $b > 1$)

Base Functions

Set of functions whose pattern with ups + downs through numerous cycles must have repeated mins/maxs $y = a \sin(bx + c) + d$
(a: amplitude, $\frac{360}{|b|}$: period, $-\frac{c}{b}$: phase shift, d: vertical shift)

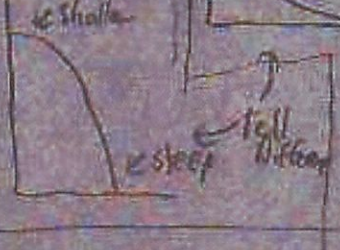
Cosine is included in the sine family because cos's graph is identical to sin's graph if cos is shifted $\rightarrow 90°$

Exponential Decay Function

The set of functions in which the output (y) decrease by the same fixed factor whenever the inputs increase by a given amount
$y = a \cdot b^x$
$0 < b < 1$

Quadratic Functions

$y = ax^2 + bx + c$



Cubic Functions

$y = ax^3 + bx^2 + cx + d$

Back →

Patterns

Linear - Outputs have a constant 1st difference when the inputs are equally spaced.

Quadratic - Outputs have a constant 2nd difference when the inputs are equally spaced.

Cubic - Outputs have a constant 3rd difference when the inputs are equally spaced.

Exponential - Outputs have a constant ratio as long as the inputs are equally spaced

- Each consecutive difference is the previous difference • (base coefficient of exponent)

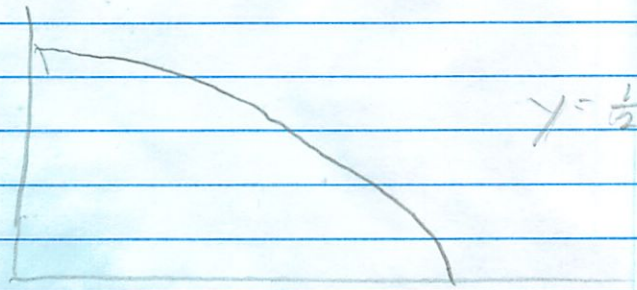
More Families (3)

5/20

functions from the same family have similar graphs, equations, forms and represent similar forms

1. An object is dropped off a cliff f(time) = distance

This would be ~~exponential~~ quadratic growth because an object keeps accelerating until it reaches terminal velocity, which I assume it wasn't.



t time falling

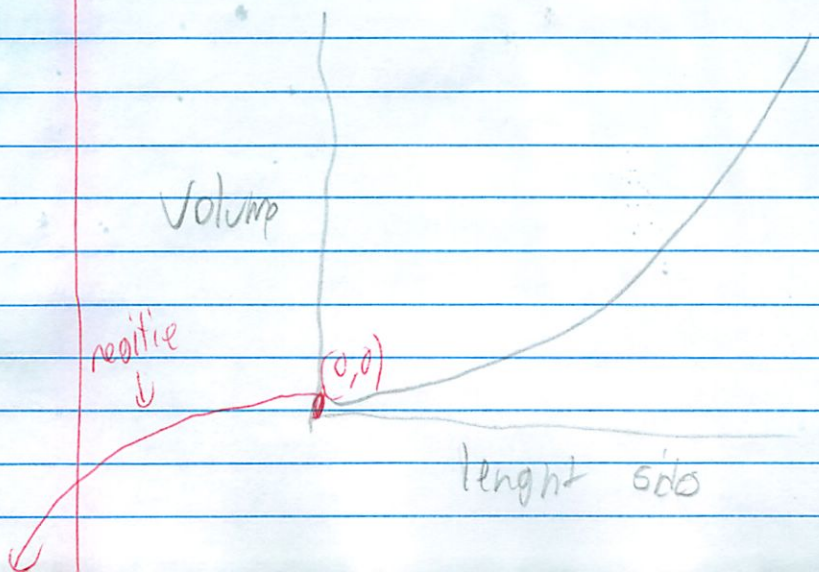
$y = \frac{1}{2} g t^2$

g gravity constant

2. Balls in cubes f(lenght of the sides) = volume

Because volume increase greater then the lenght of the sides, it is ~~exponential growth~~ cubic function

All sides are the same, will increase the same.



multiplying factor

$y = a \cdot b^x$ exponent (3)

out ↑ ↑ initial size in

Linear Tables p266

5/28

1. $f(x) = 4x + 7$

In	Out	
−1	3	+4
0	7	+4
1	11	+4
2	15	
3	19	

$y = mx + b$

The b value is always the y value when $x = 0$

The m value is how much the out value will change when x (In) increases by 1

2. $y = -2x + 5$

In	Out	1st difference
−1	7	−2
0	5	−2
1	3	−2
2	1	−2
3	−1	

always the same Δ

2b. $y = 3x - 8$

In	Out	
−1	−11	+3
0	−8	
1	−5	+3
2	−2	
3	1	

3. Generic w/ $y = 4w + 7$

In	Out	
w	$4w + 7$	+4
$w+1$	$4w + 11$	+4
$w+2$	$4w + 15$	+4
$w+3$	$4w + 19$	

same 1st difference

3.

Quadratic Tables
p 268

5/21

1. $y = x^2 + 3x - 2$

In	Out		
-5	8	-6	+2
-4	2	-4	+2
-3	-2	-2	+2
-2	-4	0	+2
-1	-4	+2	+2
0	-2	+4	+2
1	2	+6	+2
2	8		

2nd difference the same

2. $y = x^2 - 2x + 1$

In	Out		
-4	25	-16	+8
-2	9	-8	+8
0	1	0	+8
2	1	+8	+8
4	9	+16	+8
6	25		

mental thought error

= ly spaced inputs (doesn't have to be 1)

3. $y = 3x^2 + x - 4$

In	Out		
-3	26	-14	+6
-2	6	-8	+6
-1	-2	-2	+6
0	-4	+4	+6
1	0	+10	+6
2	10	+16	+6
3	26		

mental math error

Quadratic Tables

by Algebra p271

5/21

1. $y = x^2 + 2x + 3$

In	Out
-3	6
-2	3
-1	2
0	3
1	6
2	11
3	18

(-3, -2, +1, +3, +5, +7 down the Out column; +2 down the second-difference column)

same 2nd difference

2. $y = w^2 + 2w + 3$

In	Out
w	w^2+2w+3
$w+1$	w^2+4w+6
$w+2$	$w^2+6w+11$
$w+3$	$w^2+8w+18$

(+2w+3, +2w+5, +2w+7 down the Out column; +2 down the second-difference column)

same 2nd difference

$(w+1)^2 + 2(w+1) + 3$

$w^2 + 2w + 1 + 2w + 2 + 3$

$w^2 + 4w + 6$

$(w+2)^2 + 2(w+2) + 3$

$w^2 + 4w + 4 + 2w + 4 + 3$

$w^2 + 6w + 11$

$(w+3)^2 + 2(w+3) + 3$

$w^2 + 6w + 9 + 2w + 6 + 3$

Cubic Pattern (7)

5/21

1. $y = x^3$

In	Out	1st	2nd	3rd
-2	-8			
-1	-1	+7		
0	0	+1	+6	
1	1	+1	0	-6
2	8	+7	-6	-6

3. $y = w^3$

In	Out	1st	2nd	3rd
w	w^3			
$w+1$	w^3+3w^2+3w+1	$+3w^2+3w+1$		
$w+2$	$w^3+6w^2+12w+8$	$+3w^2+9w+7$	$+6w+6$	
$w+3$	$w^3+9w^2+27w+27$	$+3w^2+15w+19$	$+6w+12$	$+6$
$w+4$	$w^3+12w^2+48w+64$	$+3w^2+21w+37$	$+6w+18$	$+6$

1st: $3w^2+3w+1$, $3w^2+9w+7$, $3w^2+15w+19$, $3w^2+21w+37$

2nd: $6w+6$, $6w+12$, $6w+18$

3rd: $+6$, $+6$

$(w+1)(w+1)(w+1)$

$(w^2+2w+1)(w+1)$

$w^3+w^2+2w^2+2w+w+1$

w^3+3w^2+3w+1

$(w+2)(w+2)(w+2)$

$(w^2+4w+4)(w+2)$

$w^3+4w^2+2w^2+8w+4w+8$

$w^3+6w^2+12w+8$

$(w+3)(w+3)(w+3)$ didn't see pt 1

$(w^2+6w+9)(w+3)$

$w^3+3w^2+6w^2+18w+9w+27$

$w^3+9w^2+27w+27$

$(w+4)(w+4)(w+4)$

$(w^2+8w+16)(w+4)$

$w^3+4w^2+8w^2+32w+16w+64$

$w^3+12w^2+48w+64$

Exponential Tables
p 273

5/21

1. $y = 4^x$

In	Out	
-2	.0625	×.25 ×4
-1	.25	×.25 ×4
0	1	×.25 ×4
1	4	×.25 ×4
2	16	×.25 ×4
3	64	×.25 ×4
4	256	×.25 ×4

$4^1 = 4$

The ratio is constant
nothing about differences (subtracting)

b. $y = 2^{(3x)}$

In	Out	
-2	.015625	×.8
-1	.125	×.8
0	1	×.8
1	8	×.8
2	64	×.8
3	512	×.8
4	4069	×.8

$2^3 = 8$
↑ base raised to exponent

2. $y = 3 \cdot 2^w$ $\quad 2^1 = 2$

In	Out	
w	$3 \cdot 2^w$	×2
w+1	$3 \cdot 2^{(w+1)}$	×2
w+2	$3 \cdot 2^{(w+2)}$	

$\frac{3 \cdot 2^{(w+1)}}{3 \cdot 2^{(w)}}$ $\quad \frac{3 \cdot 2^{(w+2)}}{3 \cdot 2^{(w+1)}}$

$\frac{2^{(w+1)}}{2^{(w)}}$ $\quad \frac{2^{(w+2)}}{2^{(w+1)}}$

$2^{(w+1)-w}$ $\quad 2^{(w+2)-(w+1)}$

2^1 $\quad 2^1$

2 $\quad 2$

3. $y = 4 \cdot 3^x$

In	Out		
2	36		
3	108	+72	×3
4	324	+216	×3
5	972	+648	

ratio is constant in differences also

b. $y = .5(6^x)$

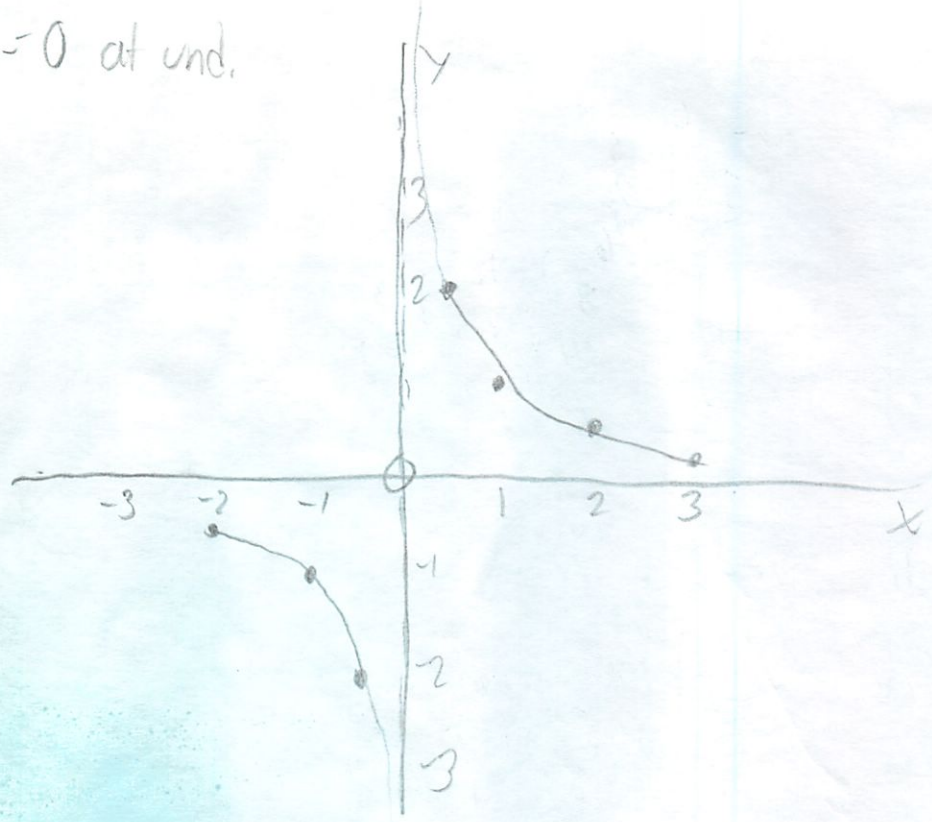
In	Out		
2	18	+90	×6
3	108	+540	×6
4	648	+3240	
5	3888		

Don't Divide That! p283

5/22

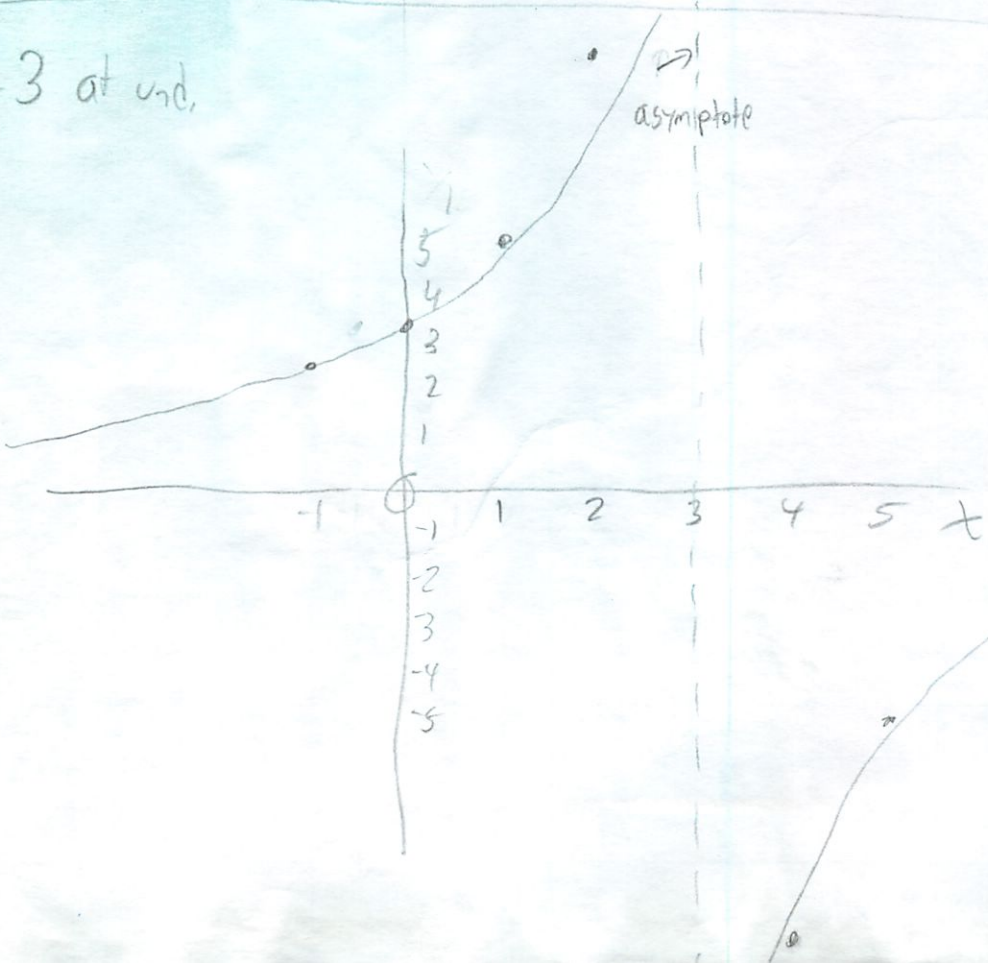
1. $y = \frac{1}{x}$ $x = 0$ at und.

x	y
-2	$-\frac{1}{2}$
-1	-1
-.5	-2
0	und.
.5	2
1	1
2	$\frac{1}{2}$
3	$\frac{1}{3}$



2. $y = \frac{10}{3-x}$ $x = 3$ at und.

x	y
-1	2.5
0	$3\frac{1}{3}$
1	5
2	10
2.5	20
3	und.
3.5	-20
4	-10
5	-5



Mystery Tables (8)

5/22

1. quadratic
$f(x) = x^2 + 1$

2. quadratic
$g(x) = x^2 - 2x$

3. linear
$h(x) = y = -5x + 2$

4. exponential growth
$F(x) = \frac{1}{2} \cdot 2^x$

5. cubic
$G(x) = 2x^3 - 4x$
Should do more to check constant

6. exponential decay
$H(x) = 3 \cdot \frac{1}{2}^x$
a decay

Average Drive (11)

5/23

1. 200 mile trip
60 mph avg = 4 hours on the road allowed

Going there (100 miles @ 60 mph) = $1\frac{2}{3}$ hrs getting there

$4 - 1\frac{2}{3} = 2\frac{1}{3}$ hrs to get home

100 miles / $2\frac{1}{3}$ hours = 42.8581 mph

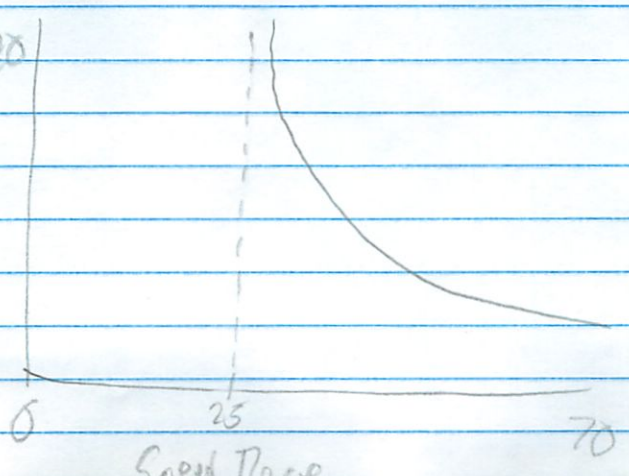
2. 200 mile trip
4 hours allowed

100 miles / 25 mph = 4 hours

That's all that is allowed
Its impossible to get back in time

3. x = avg speed on the way
y = avg speed back

$y = 100 / [4 - (100/x)]$ ✓ don't forget



Simplify

$$\frac{100}{4 - \frac{100}{x}}$$

$$\frac{100}{\frac{4x - 100}{x}}$$

$$100 \cdot \frac{x}{4(x-25)}$$

$$\frac{25x}{x-25}$$

don't forget ÷4

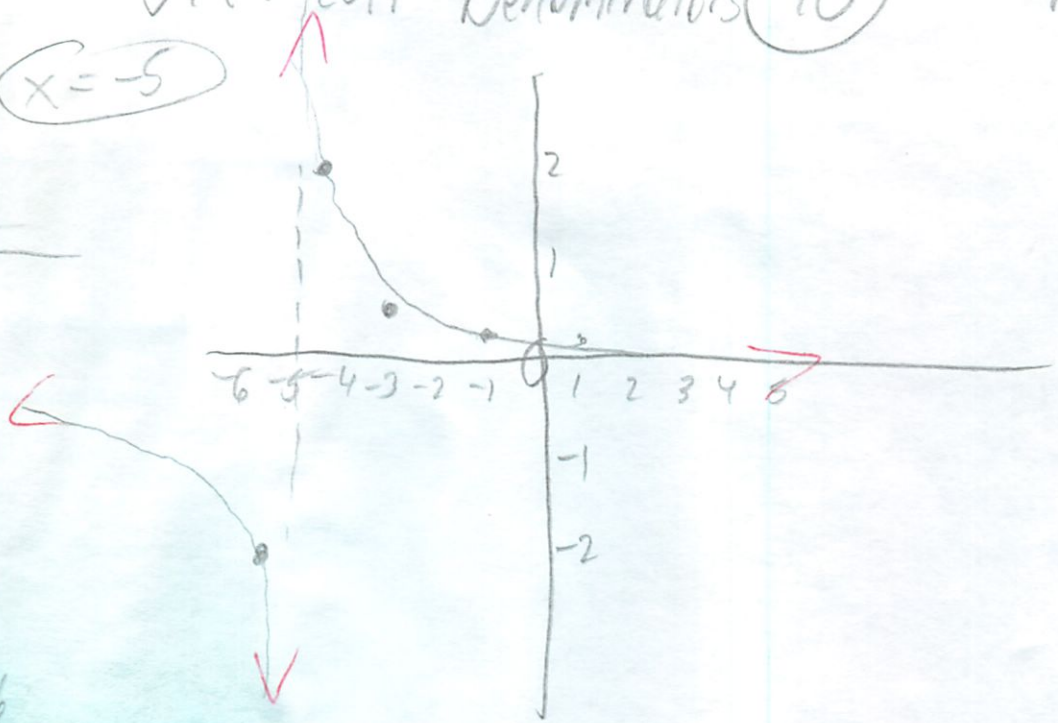
horiz asy: $y = 25$
vert asy: $x = 25$

Difficult Denominators (10)

5/23

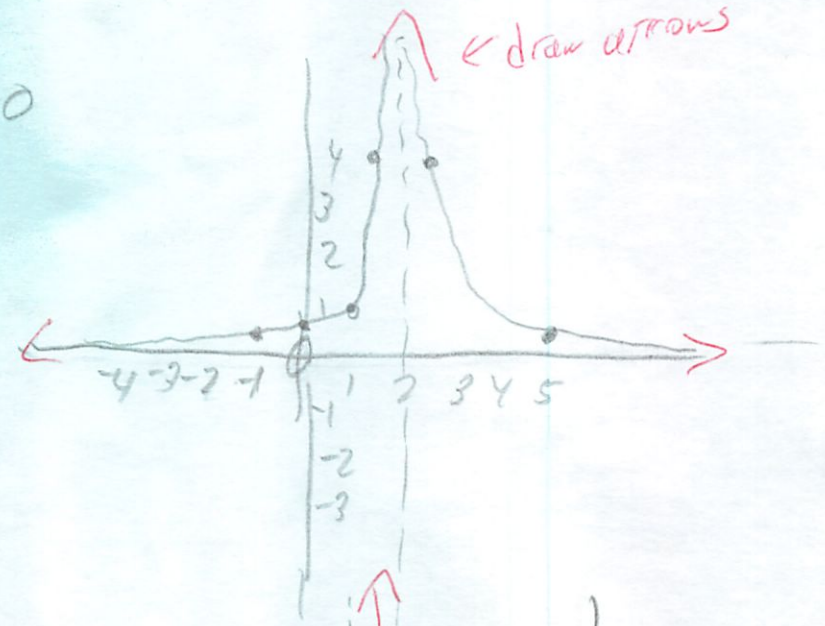
1. $y = \frac{1}{x+5}$ $x = -5$

In	Out
-5,5	-2
-5	und.
-4,5	2
-3	$\frac{1}{2}$
-1	$\frac{1}{4}$
0	$\frac{1}{8}$
1	.1666



2. $\frac{1}{(x-2)^2}$ $x^2 - 4x + 4 = 0$ -4 $x = 2$

In	Out
-1	$\frac{1}{9}$
0	$\frac{1}{4}$
1	$\frac{1}{1}$
1,5	4
2	und.
2,5	4
6	$\frac{1}{9}$



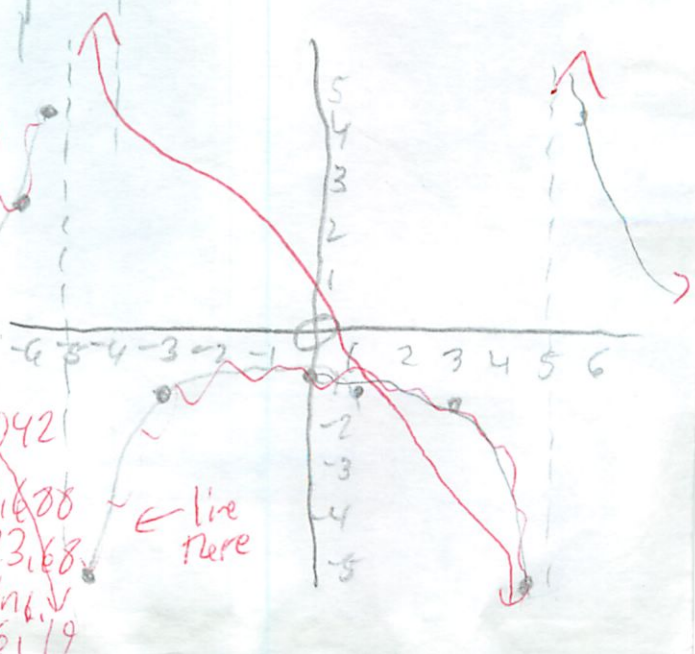
3. $\frac{25x}{x^2-25}$ $x = 5$ $x = -5$

In	Out
-6	~~2,27~~ -13,64
~~-5,5~~	~~4,76~~ -26,19
-5	und
-4,5	~~-5,26~~ 23,684
-3	~~-1,56~~ 4,68

In	Out
0	~~-1~~ ← 0
1	-1,042 -1,0421
3	-1,563 -4,688
4,5	~~-5,262~~ -23,68
5	und.
5,5	~~4,76~~ 26,19

typed wrong
Calc error

← live here



The End of the Function

p284

5/24

1. Linear

$y = -2x + 5$

$\lim_{x \to \infty} (-2x+5) = -\infty$

$\lim_{x \to -\infty} (-2x+5) = \infty$

$y = 7.5x - 2$

$\lim_{x \to \infty} (7.5x - 2) = \infty$

$\lim_{x \to -\infty} (7.5x - 2) = -\infty$

Quadratic

$y = 3x^2 + 4x - 6$

$\lim_{x \to \infty} (3x^2+4x-6) = \infty$

$\lim_{x \to -\infty} (3x^2+4x-6) = \infty$

$\lim_{|x| \to \infty} (3x^2+4x-6) = \infty$ → write w/ abs value

opposite as w/ all even 1st degree

Inverse as w/ all odd 1st degree

Cubic

$y = -2x^3 + 3x + 7$

$\lim_{x \to \infty} (-2x^3+3x+7) = -\infty$

$\lim_{x \to -\infty} (-2x^3+3x+7) = \infty$

$y = 2x^3 + 3x + 7$

$\lim_{x \to \infty} (2x^3+3x+7) = \infty$

$\lim_{x \to -\infty} (2x^3+3x+7) = -\infty$

Rational

$y = \frac{5x}{2x+5}$ vert asy = $x = -2.5$

horiz asy = $y = \frac{5}{2}$

$\lim_{x \to \infty} \left(\frac{5x}{2x+5}\right) = 2.5$

$\lim_{x \to -\infty} \left(\frac{5x}{2x+5}\right) = 2.5$

$\lim_{x \to -2.5^+} \left(\frac{5x}{2x+5}\right) = \infty$ (+ from the left)

$\lim_{x \to -2.5^-} \left(\frac{5x}{2x+5}\right) = -\infty$ (+ from the right)

$y = \frac{-4x+3}{x^3-8}$ vert asy = $x = 2$

horiz asy = $y = 0$

$\lim_{x \to \infty} \left(\frac{-4x+3}{x^3-8}\right) = 0$

$\lim_{x \to -\infty} \left(\frac{-4x+3}{x^3-8}\right) = 0$

$\lim_{x \to 2^-} \left(\frac{-4x+3}{x^3-8}\right) = +\infty$

$\lim_{x \to 2^+} \left(\frac{-4x+3}{x^3-8}\right) = -\infty$

5/20

Exponential

$y = -3[4^x]$

$\lim_{x \to \infty} \left(-3[4^x]\right) = -\infty$

$\lim_{x \to -\infty} \left(-3[4^x]\right) = 0$

decay ⊖ Inverse

$y = 2(5^x)$

$\lim_{x \to \infty} \left(2[5^x]\right) = \infty$

$\lim_{x \to -\infty} \left(2[5^x]\right) = 0$

growth ⊕ Proportional

Limit Homework 5/23

5/23

Find limit as $(x \to \infty)$ + $(x \to -\infty)$ + $(x \to$ vert. asy.$)$ + $(x \to -$vert asy.$)$

1. $\frac{3x^2-1}{6x^3-24x}$

$6x^3-24x=0$

$6x(x^2-4x)=0$

$6x(x+2)(x-2)=0$

vert asy $= x = 0, 2, -2$ (0 also works)

horiz asy $= y=0$

$\lim_{x\to\infty}\left(\frac{3x^2-1}{6x^3-24x}\right)=0$

$\lim_{x\to-\infty}\left(\frac{3x^2-1}{6x^3-24x}\right)=0$ } always horiz asy.

$\lim_{x\to0^-}\left(\frac{3x^2-1}{6x^3-24x}\right)=-\infty$

$\lim_{x\to0^+}\left(\frac{3x^2-1}{6x^3-24x}\right)=\infty$

$\lim_{x\to2^-}\left(\frac{3x^2-1}{6x^3-24x}\right)=-\infty$

$\lim_{x\to2^+}\left(\frac{3x^2-1}{6x^3-24x}\right)=\infty$

$\lim_{x\to-2^-}\left(\frac{3x^2-1}{6x^3-24x}\right)=-\infty$

$\lim_{x\to-2^+}\left(\frac{3x^2-1}{6x^3-24x}\right)=\infty$

2. $\frac{7x}{x^2+8x+15}$ horiz asy $= y=0$

$x=-3$, $x=-5$ } vert asy

$\lim_{x\to\infty}\left(\frac{7x}{x^2+8x+15}\right)=0$

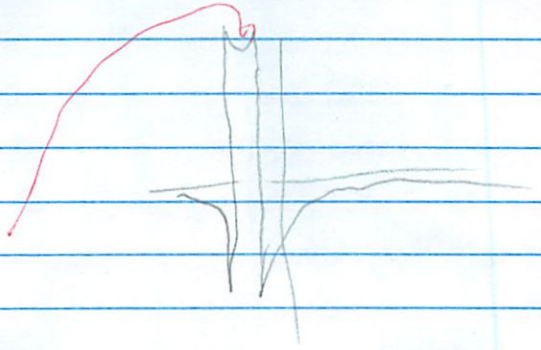
$\lim_{x\to-\infty}\left(\frac{7x}{x^2+8x+15}\right)=0$

$\lim_{x\to-3^-}\left(\frac{7x}{x^2+8x+15}\right)=+\infty$

$\lim_{x\to-3^+}\left(\frac{7x}{x^2+8x+15}\right)=-\infty$

$\lim_{x\to-5^-}\left(\frac{7x}{x^2+8x+15}\right)=-\infty$

$\lim_{x\to-5^+}\left(\frac{7x}{x^2+8x+15}\right)=+\infty$



The End You Want (12)

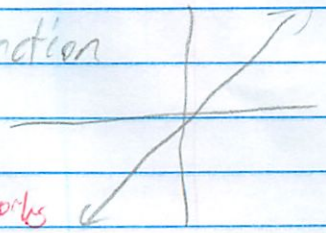
5/25

1a. $y \to \infty$, $x \to \infty$) Any positive linear function works

$y \to -\infty$, $x \to -\infty$) Any positive linear function such as:

$y = x$

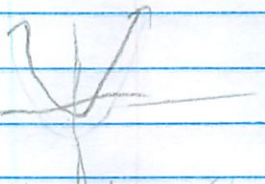
$y = x^3$ also works



b. $y \to \infty$, $x \to |\infty|$) Positive Quadratic

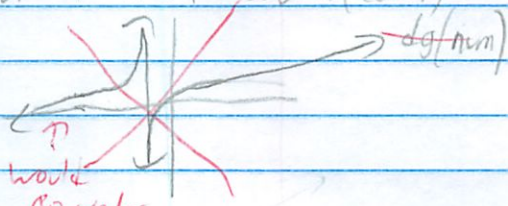
$y = x^2$

leading coefficient must be (+)



c. $y \to \infty$, $x \to \infty$) ~~Exponential growth~~ ~~Rational Function with degree (denom) ? deg (num)~~

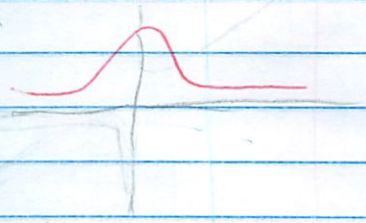
horiz asy $y \to -\infty = 0$ 2^x $\frac{x^2}{x^2+x}$



would go under

d. $|y| \to |\infty| = 0$ horiz. no vert asymptote

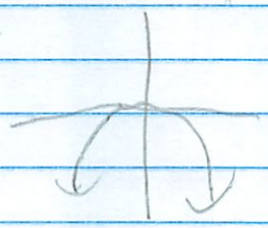
~~no way to have no vert asy~~



2a. $y \to \infty$

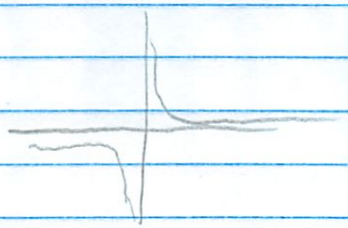
$x \to |\infty|$ negitive quadratic

$y = -x^2$



b. horiz asy $x \to |\infty| = 0$

$\frac{x}{x^2}$



Warmup
5/29

5/24

Find the following Limits

1. $\lim_{x \to -\infty} (2x^3 - 5x - 4) = -\infty$ ← same −/(+) cubic

2. $\lim_{x \to \infty} (-mx + b) = -\infty$ → diff w/ (−) linear

← graph + see where the y is heading when x goes there

Inverse when degree odd + leading coefficient (−)

← See "End of Function"

← graph + look at

3. $\lim_{x \to 4^+} \left(\frac{3x+2}{x-4}\right) = -\infty$

4. $\lim_{x \to \infty} \left(\frac{3x+2}{x-4}\right) = 3$

← rational; find horiz asy

$y = 3$

Function Operations

5/29

1. If $f(x) = x+1$ and $g(x) = 3x-2$
Then what is $(f+g)x$ → (which is $f(x)+g(x)$)
$(x+1) + (3x-2)$
$4x-1$

2. $(f-g)x \rightarrow (x+1) - (3x-2)$
$x+1-3x+2$
$-2x+3$

3. $(f \cdot g)x \rightarrow (x+1)(3x-2)$
$3x^2-2x+3x-2$
$3x^2+x-2$

4. $\left(\frac{f}{g}\right)x \rightarrow \frac{(x+1)}{(3x-2)}$ Can't simplify
$\frac{x+1}{3x-2}$

5. $f(x) = x+1$ ← copied problem wrong
$g(x) = x^2+3x-4$

$(f+g)x \rightarrow (x+1)+(x^2+3x-4)$
x^2+4x-3

$(g-f)x \rightarrow (x^2+3x-4) - (x+1)$
$x^2+3x-4-x-1$
x^2+2x-5

$(f \cdot g)x \rightarrow (x+1)(x^2+3x-4)$
$x^3+3x^2-4x+x^2+3x-4$
x^3+4x^2-x-4 ?

$\left(\frac{g}{f}\right)x \rightarrow \frac{x^2+3x-4}{x+1}$
$\frac{(x-1)(x+4)}{x+1}$

Function Evaluation

5/30

1. If $f(x) = 2x - 5$
Find $f(4)$

$2(4) - 5$

$8 - 5$

$f(4) = 3$

2. If $f(x) = x + 3$, $g(x) = 4x^2$
Find $(f+g)(2)$

$(f+g) = 4x^2 + x + 3$

$4(2)^2 + (2) + 3$

$16 + 5$

$(f+g)(x)\ 21$

Or one, then add together

3. If $f(x) = -(x^2) + 4$, $g(x) = 3x^2 - x - 2$
Find $(g-f)(-3)$

$3x^2 - x - 2 - [-(x^2) + 4]$

$3x^2 - x - 2 + x^2 - 4$

$4x^2 - x - 6$

$4(-3)^2 - (-3) - 6$

$36 + 3$

33

Function Composition

5/30

substituting one function into another for the variable

$(f \circ g)(x)$ substitute $g(x)$ into $f(x)$ for the variable

↑ open oval = "of"

$(g \circ f)(x)$

1. Let $f(x) = x^2 - 1$, $g(x) = 3x$

$(f \circ g)(x)$

$(3x)^2 - 1$

$9x^2 - 1$ & simplify

$(g \circ f)(x)$

$3(x^2 - 1)$

$3x^2 - 3$

2. If $f(x) = x - 4$, $g(x) = x^2$

$(f \circ g)(x)$

$(x^2) - 4$

$x^2 - 4$

$(g \circ f)(x)$ $(x-4)^2$

$x^2 - 8x + 16$

3. If $f(x) = x^2 - 3x$, $g(x) = x + 4$

$(f \circ g)(x)$

$(x+4)^2 - 3(x+4)$

$x^2 + 8x + 16 - 3x - 12$

$x^2 + 5x + 4$

4. $f(x) = x^2 - 2x - 2$

$g(x) = x - 2$

$(f \circ g)(-1)$

$(x-2)^2 - 2(x-2) - 2$

$x^2 - 4x + 4 - 2x + 4 - 2$

$x^2 - 6x + 6$

$(-1)^2 - 6(-1) + 6$

$1 + 6 + 6$

13

Could also

$g(-1) = (-1) - 2$

$g(-1) = -3$

$f(-3) = (-3)^2 - 2(-3) - 2$

$9 + 6 - 2$

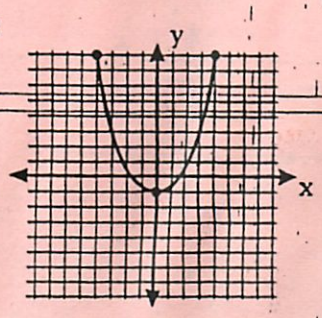
13

Name _____ Period ____

Domain and Range

Find the domain and range from the graph.
Each box on the graph equals 1 unit.

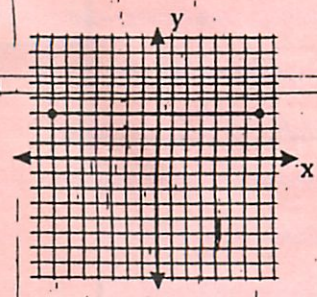
Example:



Domain: $-4 \leq x \leq 4$
Range: $-1 \leq y \leq 8$

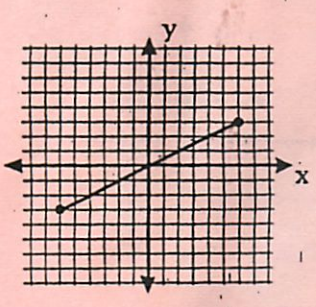
worksheet mistake

1.



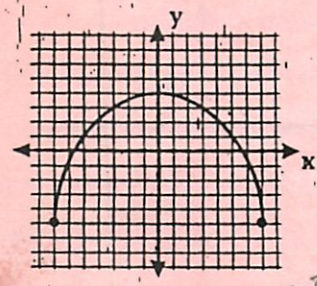
Domain: $-7 \leq x \leq 7$
Range: $y = 3$

2.



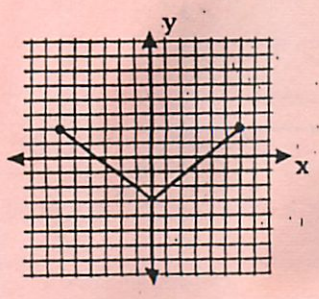
Domain: $-6 \leq x \leq 6$
Range: $-3 \leq y \leq 3$

3.



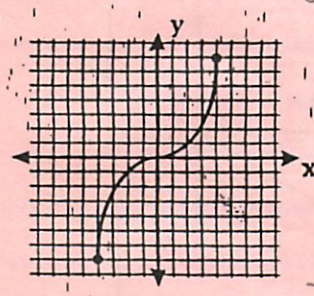
Domain: $-7 \leq x \leq 7$
Range: $-5 \leq y \leq 4$

4.



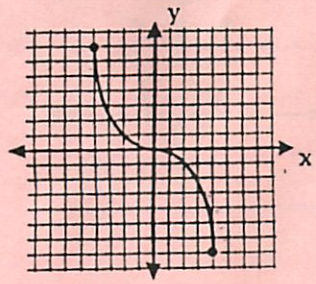
Domain: $-6 \leq x \leq 6$
Range: $-3 \leq y \leq 2$

5.



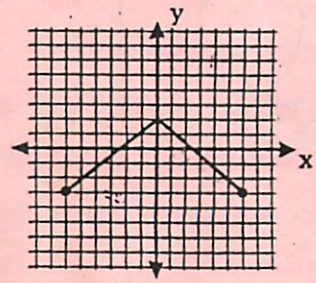
Domain: $-4 \leq x \leq 4$
Range: $-7 \leq y \leq 7$

6.



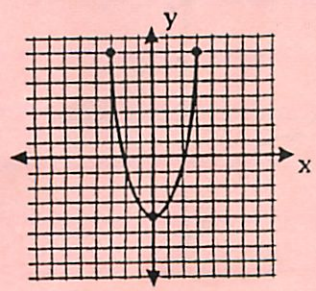
Domain: $-4 \leq x \leq 4$
Range: $-7 \leq y \leq 7$

7.



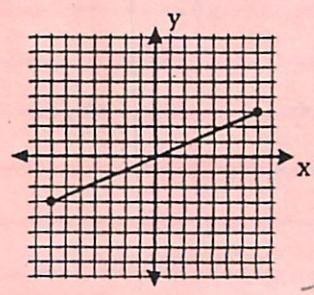
Domain: $-6 \leq x \leq 6$
Range: $-3 \leq y \leq 2$

8.



Domain: $-3 \leq x \leq 3$
Range: $-4 \leq y \leq 7$

9.



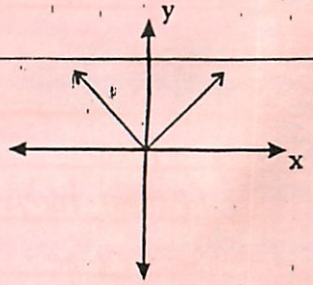
Domain: $-7 \leq x \leq 7$
Range: $-3 \leq y \leq 3$

Name _____ Period ____

Domain and Range

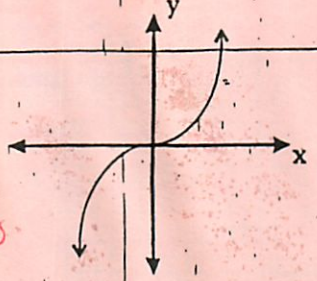
Find the domain and range of each function.
Domain: Allowable values of x **Range:** y values

Example:



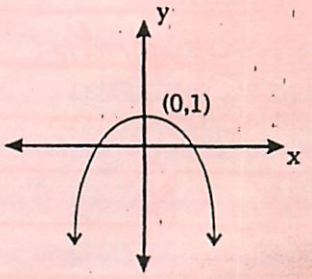
Domain: all Reals {ℝ}
Range: positive Reals (including 0)
{ℝ : $y \geq 0$}

1.



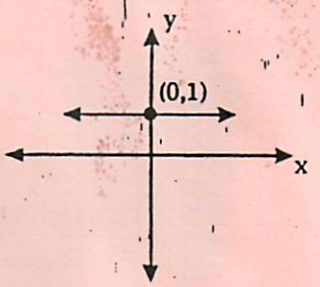
Domain:
Range:

2.



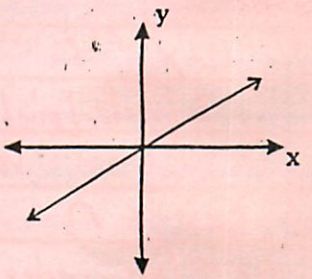
Domain:
Range:

3.

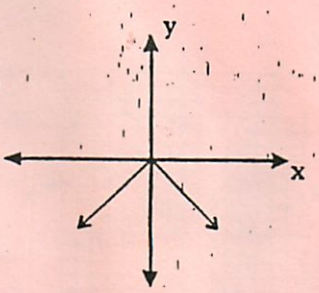


Domain:
Range:

5.

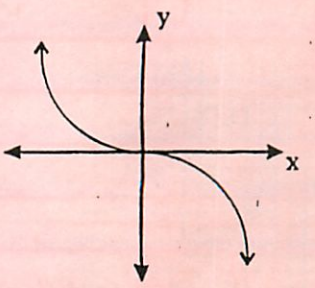


Domain:
Range:



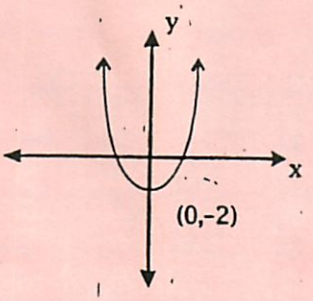
Domain:
Range:

6.



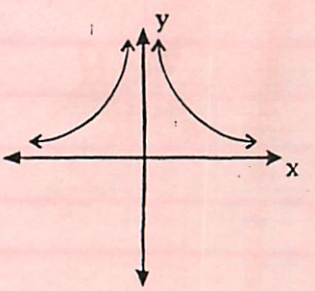
Domain:
Range:

7.



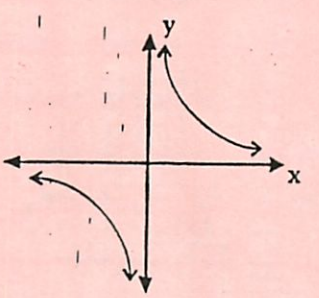
Domain:
Range:

8.



Domain:
Range:

9.



Domain:
Range:

Domain + Range

5/31

Linear

$\mathbb{R}$ = All real

$y = 2x + 5$
Domain: $\mathbb{R}$
Range: $\mathbb{R}$

$y = -\frac{4}{5}x - 2$
Domain: $\mathbb{R}$
Range: $\mathbb{R}$

For any linear equation (except horiz. lines) the domain + range = $\mathbb{R}$

Quadratic

For any quadratic equation

Domain = $\mathbb{R}$

$y = x^2 - 4x - 5$
Domain: $\mathbb{R}$
Range: $y \geq -9$
(graph: min / parabola opens up)

Range:
If $\exists x^2 \in \cup$
$y \geq$ (vertex [min] y value)

$y = -x^2 + 6x + 2$
Domain: $\mathbb{R}$
Range: $y \leq 11$
(graph: max / parabola opens down)

If $\exists x^2 \in \cap$
$y \leq$ (max vertex y value)

$y = 2x^2 - x + 4$
Domain: $\mathbb{R}$
Range $y \geq 3.875$

Cubic

For all cubic equations
Domain: $\mathbb{R}$
Range: $\mathbb{R}$

$y = x^3$
Domain = $\mathbb{R}$
Range = $\mathbb{R}$

$y = 4x^3 - 3x^2 + 2x + 5$
Domain = $\mathbb{R}$
Range = $\mathbb{R}$

Domain + Range

Rational - only talk about range

$y = \frac{-5x+6}{2x+10}$

Domain = $\mathbb{R} \neq -5$ ← vertical asymptote

$y = \frac{7}{2x^2+5x-3}$

Domain = $\mathbb{R} \neq \frac{1}{2}, -3$

For any rational function

Domain = $\mathbb{R} \neq$ all vertical asymptotes

→ to find, set denom = 0 solve

NAME _____ CLASS _____ DATE _____

Domain: R except #6, 7, 12, 13

Domain: Range

Practice

2.4 Operations With Functions

Find $f+g$ and $f-g$.

1. $f(x) = 7x^2 + 5x; g(x) = x^2 - 13$ — $8x^2+5x-13$; $6x^2+5x+13$
2. $f(x) = 41 - 5x; g(x) = 13x^2$ — $13x^2-5x+41$; $-13x^2-5x+41$
3. $f(x) = x^2 + \frac{1}{3}x + 9; g(x) = -7x - 7$ — $x^2+6\frac{2}{3}x+2$; $x^2+7\frac{1}{3}x+16$
4. $f(x) = -9x^2 + 6; g(x) = 12x^2$ — $3x^2+6$; $-21x^2+6$

Find $f \cdot g$ and $\frac{f}{g}$. State any domain restrictions.

5. $f(x) = 35x + 5; g(x) = 5$ — $175x+25$; $7x+1$
6. $f(x) = x^2 + 25; g(x) = 3x + 17$ — $3x^3+17x^2+75x+425$; $\frac{x^2+25}{3x+17}$
7. $f(x) = x^2 + 16; g(x) = x^2 - 16$ — $x^4-16x^2+16x^2-256$ → x^4-256 ; $\frac{x^2+16}{x^2-16}$

+	−
$y \geq -13$	$y \geq -41$
$y \geq 40$	$y \leq 32$
$y \geq -4$	$y \geq 86$
$y \geq 6$	$y \leq 6$
×	÷
R	R
R	$R \neq -5\frac{2}{3}$
R	$R \neq 4$

Let $f(x) = -2x - 2$ and $g(x) = x + 10$. Find each new function, and state any domain restrictions.

8. $f+g$ — $-x+8$
9. $f-g$ — $-3x-12$
10. $g-f$ — $3x+12$; $-2x-2$
11. $f \cdot g$ — $-2x^2-22x-20$
12. $\frac{f}{g}$ — $\frac{x+10}{-2x-2}$
13. $\frac{g}{f}$ — $\frac{-2x-2}{x+10}$

Even	Odd
R	R
R	$R \leq 40.5$
$R \neq -10$	$R \neq -1$

Substitute

Find $f \circ g$ and $g \circ f$.

14. $f(x) = 3x - 2; g(x) = \frac{1}{3}(x+2)$ — $3[\frac{1}{3}(x+2)]-2$ → $x+2-2$ → x ; $\frac{1}{3}([3x-2]+2)$ → $\frac{1}{3}(3x)$ → x
15. $f(x) = 4x; g(x) = x^2 - 1$ — $4(x^2-1)$ → $4x^2-4$; $(4x)^2-1$ → $16x^2-1$
16. $f(x) = -x^2 + 1; g(x) = x$ — $-(x)^2+1$; $(-x^2+1)$

Let $f(x) = 11x$, $g(x) = x^2 - 5$, and $h(x) = 2(x-4)$. Evaluate each composite function.

17. $(f \circ g)(-1)$ — $11(x^2-5)$ → -44
18. $(h \circ f)(-2)$ — $2(11x-4)$ → -52
19. $(h \circ g)(2)$ — $2(x^2-5-4)$ → -10
20. $(g \circ h)(4)$ — $[2(x-4)]^2-5$ → -5
21. $(g \circ f)(0)$ — $(11x)^2-5$ → -5
22. $(f \circ h)(5)$ — $11(2[x-4])$ → 22
23. $(f \circ g)(0)$ — -55
24. $(h \circ h)(-1)$ — $2([2(x-4)]-4)$ → -28
25. $(f \circ f)(2)$ — $11(11x)$ → 242

IAG IV - Independent Study

Solving Equations

For the fourth marking period, you will be studying all kinds of equations. The content for each topic is located in your Algebra 2 Textbook. At the end of your studying of these topics, you should be prepared to do the following:

Solving Equations (3.6, 5.1, 5.3, 5.4, 5.6)	Solving Equations (7.5, 9.3, 10.4)
▪ solve absolute value equations and inequalities ▪ solve systems of linear equations in three variables ▪ solve quadratic equations by finding square roots ▪ Solve quadratic equations by completing the square ▪ solve quadratic equations by using quadratic formula	▪ solve any quadratic equation ▪ solve radical equations ▪ factor polynomials and solve polynomial equations ▪ solve rational equations

For the assignments below:

- **Write the section and problem #'s at the top of your paper**
- **Copy the problem**
- ***Show all work***
- **Each section should be a new page**
- **Neatness and organization count**

Assignments are for the following sections:

- Section 1.7: p. 47 - #13, 17, 25, 27) front + back
- Section 3.6: p. 162 - #23 and 27
- Section 5.1: p. 233 - #13
- Section 5.3: p. 248 - #13 and 21
- Section 5.4: p. 255 - #21 and 25
- Section 5.6: p. 268 - #11, 19, 21
- Section 7.5: p. 378 - #11, 13, 19, 23, 25, 27
- Section 9.3: p. 478 - # 51, 53, 55, 57
- Section 10.4: p. 546 - # 25, 31, 41, 43

Test : Mon June 4

Good Luck.

This assignment is due on: 5/31

Name: Michael Plusnick

Score: 28/28

1.7 Solving Absolute Value Equations + Inequalities

5/22

#13, 17, 25, 27 - p47

Solve

13. $|9+2x|=7 \rightarrow 9+2x=-7$

$-9 \quad -9$

$\frac{2x}{2}=\frac{-2}{2} \qquad \frac{2x}{2}=\frac{-16}{2}$

$x=-1 \qquad x=-8$

17. $|20-3x|=7 \qquad 20-3x=-7$

$-20 \quad -20 \qquad -20 \quad -20$

$\frac{-3x}{-3}=\frac{-13}{-3} \qquad \frac{-3x}{-3}=\frac{-27}{-3}$

$x=4\frac{1}{3}$ or $\frac{13}{3} \qquad x=9$

25. $|14-5x| \geq 8$

$-8 \geq 14-5x \geq 8$

$-14 \quad -14 \quad -14$

$\frac{-22}{-5} \geq \frac{-5x}{-5} \geq \frac{-6}{-5}$

$4.4 \leq x \leq 1.2$

Rules for switching again:

When $\times$ or $\div$ by $\ominus$ #

$x \geq \frac{22}{5} \rightarrow x \leq \frac{6}{5}$

27. $|2x+3| \geq 26 \qquad 2x+3 \leq -26$

$-3 \quad -3 \qquad -3 \quad -3$

$\frac{2x}{2} \geq \frac{23}{2} \qquad \frac{2x}{2} \leq \frac{-29}{2}$

$x \geq 11.5 \qquad x \leq -14.5$

$(x \geq \frac{23}{2}) \quad$ or $\quad (x \leq -\frac{29}{2})$

3.6 Solving Linear Equations in 3 variables

p162 # 23, 27

Solve

23 $\begin{cases} 2x-4y+2z=16 \\ -2x+5y+2z=-34 \\ x-2y+2z=4 \\ yx-2y+2=8 \end{cases}$ $\div 2$ $\div 3$

$y+4z=-18$

$-x+2y-2=-8$ $\Big\}$ $z=-4$

$x+4(-4)=-18$

$+16 \quad +16$

$y=-2$

$x-2(-2)+2(-4)=4$

$-4 \quad +8 \quad +4$

$x=8$

27 $\begin{cases} 2x+6y-4z=8 \\ 3x+10y-7z=12 \\ 2x-2y+5z=7 \\ yx+3y-2z=4 \end{cases}$ $\times 3$

$4x+4y+2=15 \Rightarrow (z=5)$ $\Big\}$ $x+z=0$

$-3x-9y+6z=-12$

$x+3(5)-2(5)=4$

$-15 \quad +10 \quad -5$

$x=-1$

$x+(5)=0$

$-5 \quad -5$

$x=5$

by Finding Square Roots

8/22

p. 233

#13

13. Solve

$3x^2 - 7 = 2(x^2 + 3)$

$3x^2 - 7 = 2x^2 + 6$

$-2x^2 \quad -6 \quad -2x^2 \quad -6$

$1x^2 - 13 = 0$

$+13 \quad +13$

$1x^2 = 13$

$\sqrt{x^2} = \sqrt{13}$

$x = \pm\sqrt{13}$

6.3 Quadratic Equations & Parabolas

5/22

p248 #13, 21

Solve

13. $x^2+10x+24=0$

$-24 \quad -24$

$x^2+10x=-24$

$x^2+10x+(5)^2=-24+(5)^2$

$(x+5)^2=1$

$x+5=\pm\sqrt{1}$

$-5 \quad -5$

$x=\pm\sqrt{1}-5$

$x=-4 \quad x=-6$

What is all this??

Oh - its that type of problem. This = much easier

$+ \quad \times$

$x^2+10x+24=0$ Find factors of 24 which add up to 10

$(x+4)(x+6)$

$x=-4 \quad x=-6$

21. $3x^2+9x+1=0$

$-1 \quad -1$

$\frac{3x^2+9x=-1}{3} \quad \frac{}{x}=-3$

$x^2+3x=-\frac{1}{3}$

$+(1.5)^2 \quad +(1.5)^2$

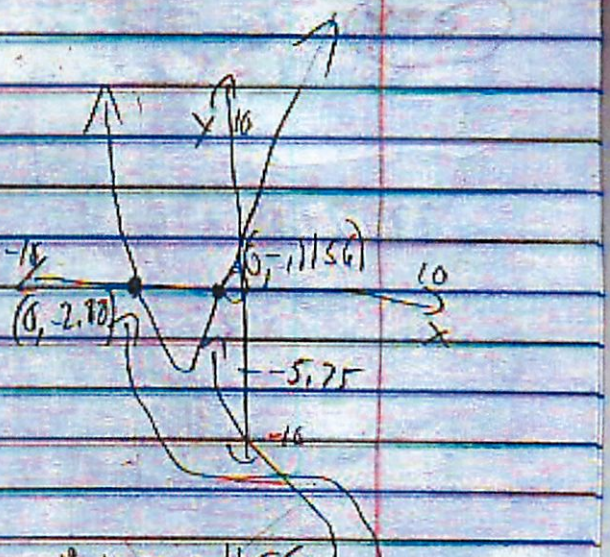
$x^2+3x+2.25=\frac{23}{12}$

$(x+1.5)^2=\frac{23}{12}$

$x+1.5=\pm\sqrt{\frac{23}{12}}$

$-1.5 \quad -1.5$

$x=\pm\sqrt{\frac{23}{12}}-1.5$



Wolfram $x=-.1156$

$x=-2.8844$

6.4 Quadratic Formula

5/22

p255 # 21, 25

Solve w/ quadratic formula $\left(x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}\right)$

21. $-5x^2 - 15x + 10 = 0$

$$\frac{-(-15) \pm \sqrt{(-15)^2 - 4(-5)(10)}}{2(-5)}$$

(1)

$$\frac{15 \pm \sqrt{425}}{-10}$$

$x = -3.5615$ ← or → $-\frac{3}{2} + \frac{\sqrt{425}}{10}$ ← Simplify

$x = .15615$

25. $-13x^2 - 9x + 4 = -5 + 2x^2 - x$

$-2x^2 + x \quad -5 \quad -5 \quad -2x^2 + x$

$-15x^2 - 8x - 1 = 0$

$$\frac{-(-8) \pm \sqrt{(-8)^2 - 4(-15)(-1)}}{2(-15)}$$

(V)

$$\frac{8 \pm \sqrt{4}}{-30}$$

$x = -\frac{1}{3}$

$x = -\frac{1}{5}$

6.6 Solve any Quadratic Equation 5/22

p268 # 11, 19, 21

Solve

11. $-x^2+5x-9=0$

$$\frac{-(5)\pm\sqrt{(5)^2-4(-1)(-9)}}{2(-1)}$$

$$\frac{-5\pm\sqrt{-11}}{-2} \rightarrow \sqrt{-1}\cdot\sqrt{11}$$

$$\frac{-5\pm i\sqrt{11}}{-2}$$

$i\sqrt{11}$ typically shown 1st

$$\frac{5}{2}\pm\frac{\sqrt{11}}{2}i$$

$\sqrt{-8} \rightarrow i\sqrt{8}$, $2i\sqrt{2}$

19. $16x-x^2=-4-22x^2$

$-16x+x^2 \quad -16x+x^2$

$-21x^2-16x-4=0$

$$\frac{-(-16)\pm\sqrt{(-16)^2-4(-21)(-4)}}{2(-21)}$$

$$\frac{16\pm\sqrt{-80}}{-42}$$

$$\frac{16\pm\sqrt{80}i}{-42} \rightarrow \frac{4i\sqrt{5}}{42} \rightarrow \frac{-8}{21}+\frac{2i\sqrt{5}}{21}$$

reduce

$$\frac{8}{21}+\frac{\sqrt{80}}{42}i$$

21. $13x^2-5=x+10x^2-8$

$-13x^2+5 \quad -13x^2+5$

$-3x^2+x-3=0$

$$\frac{-(1)\pm\sqrt{(1)^2-4(-3)(-3)}}{2(-3)}$$

$$\frac{-1\pm\sqrt{-35}}{-6}$$

$$\frac{-1\pm\sqrt{35}i}{-6} \rightarrow \frac{1}{6}\pm\frac{\sqrt{35}}{6}i$$

7.5 Solving Radical Equations

5/24

p378 #11, 13, 19, 23, 25, 27

Solve + Check for Extraneous

11. $\sqrt{x} = 20$

$x = 20^2$

$x = 400$

$\sqrt{400} = 20$ ✓

13. $y^{1/3} - 7 = 0$

$+7 \quad +7$

$y^{1/3} = 7$

$\sqrt[3]{y} = 7$

$y = 7^3$

$y = 343$

$(343)^{1/3} - 7 = 0$ ✓

19. $(x-2)^{3/2} = -8$

$[(x-2)^{3/2}]^{2/3} = -8^{2/3}$

$(x-2) = \sqrt[3]{-8^2}$

$x - 2 = \sqrt[3]{64}$

$x - 2 = 4$

$+2 \quad +2$

$x = 6$

$(6-2)^{3/2} = -8$

$4^{3/2}$

$8 = -8$ ✗

Extraneous - no solution

23. $\sqrt[4]{x+2} + 9 = 14$

$-9 \quad -9$

$\sqrt[4]{x+2} = 5$

$(\sqrt[4]{x+2})^4 = 5^4$

$x + 2 = 625$

$-2 \quad -2$

$x = 623$

$\sqrt[4]{623+2} + 9 = 14$ ✓

25. $\sqrt{x^2+5} = x+3$

$(\sqrt{x^2+5})^2 = (x+3)^2$

$x^2+5 = x^2+6x+9$

$-x^2-5 \quad -x^2 \quad -5$

$6x+4=0$

$-4 \quad -4$

$\frac{6x=-4}{6 \quad 6}$

$x=-\frac{2}{3}$

$\sqrt{(-\frac{2}{3})^2+5} = 2\frac{1}{3}$ ✓

$(-\frac{2}{3})+3 = 2\frac{1}{3}$

27. $\sqrt{x+3} = \sqrt{2x-1}$

$(\sqrt{x+3})^2 = (\sqrt{2x-1})^2$

$x+3=2x-1$

$-x \quad -3 \quad -x \quad -3$

$x-4=0$

$+4 \quad +4$

$x=4$

$\sqrt{4+3} = \sqrt{7}$ ✓

$\sqrt{8-1} = \sqrt{7}$

9.3 Factoring & Solving Polynomial Equations

5/24

p478 #51, 53, 55, 57

Find Solutions

51. $x^2 - 3x = 0$

$x(x-3)$

$x = 0$ $\quad x - 3 = 0$

$x = 0$ $\quad x = 3$

53. $x^2 + 8x + 16 = 0$

$(x+4)(x+4)$

$x + 4 = 0 \quad x + 4 = 0$

$-4 \quad -4 \quad -4 \quad -4$

$x = -4$

55. $x^3 - 15x^2 + 75x - 125 = 0$

$(x^3 - 125) + (-15x^2 + 75x)$

$(x-5)(x^2 + 5x + 25) - 15x(x-5)$

$(x-5)(x^2 + 10x + 25)$ $\quad (x-5)$

$x - 5 = 0 \quad (x-5) \quad (x-5) \quad x - 5 = 0$

$+5 \quad +5$

$x = 5 \quad (x=5) \quad (x=5) \quad (x=5)$

57. $2x^2 - x = 3$

$-3 \quad -3$

$2x^2 - x - 3 = 0$

$-6x$

$-3 \quad 2$

$-1 \quad +1$

x | $2x$ | $-3x$

$+$ | 1 | $2x$ | -3

$(2x-3)(x+1)$

$2x - 3 = 0 \quad x + 1 = 0$

$+3 \quad +3 \quad -1 \quad -1$

$\frac{2x}{2} = \frac{3}{2} \quad x = -1$

$x = \frac{3}{2}$

10.4 Solving Rational Equations

8/24

p546 # 25, 31, 41, 43

Solve + V

25. $\frac{10}{x+3} + \frac{10}{3} = 6$

$\frac{10(3)}{(x+3)(3)} + \frac{10(x+3)}{3(x+3)} = \frac{6(3)(x+3)}{3(x+3)}$

$30 + 10x + 30 = 18(x+3)$

$10x + 60 = 18x + 54$

$-10x \quad -54 \quad -10x \quad -54$

$\frac{6}{8} = \frac{8x}{8}$

$\frac{3}{4} = x$

31. $\frac{2x}{5} = \frac{x^2 - 5x}{5x}$

$\frac{2x(x)}{5(x)} = \frac{x^2 - 5x}{5x}$

$2x^2 = x^2 + 5x$

$-2x^2 \quad -2x^2$

$-x^2 - 5x = 0$

$-1 \quad -1 \quad -1$

$x^2 + 5x = 0$

$5 \times 0 = 0$, $0 + 5 = 5$

$(x+5)(x) \rightarrow (x=0)$ (doesn't count) (extraneous)

$x + 5 = 0$

$-5 \quad -5$

$x = -5$

41. $\frac{2x}{x+2} - \frac{1}{x^2-4} = 1$

$\frac{2x}{x+2} - \frac{1}{(x+2)(x-2)} = \frac{1}{1}$

$\frac{2x(x-2)}{(x+2)(x-2)} - \frac{1}{(x+2)(x-2)} = \frac{(x+2)(x-2)}{(x+2)(x-2)}$

$2x^2 - 4x - 1 = x^2 - 4$

$-x^2 + 3$

$x^2 - 4x + 3 = 0$

$(x-3)(x-1)$

$x - 3 = 0$ $\quad x - 1 = 0$

$+3 \quad +3$ $\quad +1 \quad +1$

$x = 3$ $\quad x = 1$

43. $\frac{3}{2x+4} - \frac{3x+1}{3x^2+2} = \frac{2}{x+2}$

$\frac{3}{2(x+2)} - \frac{3x+1}{3x^2+2} = \frac{2}{x+2}$

$\frac{3(3x^2+2)}{(2x+4)(3x^2+2)} - \frac{(3x+1)(2x+4)}{(3x^2+2)(2x+4)} = \frac{2(2)(3x^2+2)}{2(x+2)(3x^2+2)}$

$9x^2 + 6 - [6x^2 + 12x + 2x + 4] = 4(3x^2 + 2)$

$24x^2 + 16 - 6x^2 - 14x - 4 = 12x^2 + 8$

$18x^2 - 14x + 12 = 12x^2 + 8$

$-12x^2 \quad -8 \quad -12x^2 \quad -8$

$6x^2 - 14x + 4 = 0$

24

$-2 \quad -12$

-14

	$3x$	-1
$2x$	$6x^2$	$-2x$
-4	$-12x$	4

$(3x-1)(2x-4)$

$+1 \quad +1 \quad +4 \quad +4$

$\frac{3x}{3} = \frac{1}{3} \quad \frac{2x}{2} = \frac{4}{2}$

$x = \frac{1}{3} \quad x = 2$

715/72

99%

Chapter 10 Test (L1) 66/66

66/72 Points

Calculator Section

Name Mike P.

Date 5/17/07

Read all directions and SHOW ALL WORK!! Multiply or divide and simplify each of the following expressions. You may use your calculator on this portion of the test. Circle your answer.

1. $\frac{5xy^7}{2x^2y} \cdot \frac{8xy}{x^3y^2}$ (3 pts)

$\frac{40x^2y^8}{2x^5y^3}$

$\frac{20y^5}{x^3}$ ✓

2. $\frac{x^2-16}{2x+6} \cdot \frac{x+3}{x-4}$ (4 pts)

$\frac{(x+4)(x-4)}{2(x+3)} \cdot \frac{x+3}{x-4}$

$\frac{x+4}{2}$ ✓

3. $\frac{2x^2-8}{6(x-2)} \div \frac{x^2+10x+16}{x^2+5x-14}$ (6 pts)

$\frac{2(x^2-4)}{6(x-2)} \cdot \frac{x^2+5x-14}{x^2+10x+16}$

$\frac{2(x+2)(x-2)}{6(x-2)} \cdot \frac{(x-2)(x+7)}{(x+2)(x+8)}$

$\frac{2(x-2)(x+7)}{6(x+8)}$

$\frac{(x-2)(x+7)}{3(x+8)}$

✓ was copy error

4. $\frac{x^2+2x-8}{2x^2-3x+1} \div \frac{x^2+x-6}{4x-2}$ (6 pts)

↓ 2 steps: flip + factor

$\frac{(x-2)(x+4)}{(x-1)(2x+1)} \cdot \frac{2(2x-1)}{(x-2)(x+3)}$

$\frac{2(x+4)}{(x-1)(x+3)}$ ✓

	x	-1
2	$2x^2$	$-2x$
-7	$-1x$	$+1$

$-3x+1$

19

12 → −24, −7 → 5

	x	+6
2x	$2x^2$	12x
−7	−7x	−42

don't need to do

Add or subtract and simplify each of the following expressions. Circle your answer.

5. $\frac{4x}{3x-3} - \frac{x+2}{x-1}$ (4 pts)

$\frac{4x}{3x-3} - \frac{(x+2)(3)}{3(x-1)}$

$\frac{4x-[3(x+2)]}{3x-3}$

$\frac{4x-3x-6}{3x-3}$

$\frac{x-6}{3x-3}$ ✓ More?

6. $\frac{2x^2+5x-42}{x^2+10x+24} \div \frac{(x-5)}{(x+4)}$ (6 pts)

$\frac{2x^2+5x-42}{(x+4)(x+6)} \cdot \frac{(x+4)}{(x-5)}$

$\frac{2x^2+5x-42}{(x+4)(x+6)} \cdot \frac{(x-5)(x+6)}{(x+4)(x+6)}$

$\frac{2x^2+5x-42}{(x+4)(x+6)} - \frac{[x^2+6x-5x-30]}{(x+4)(x+6)}$

$\frac{x^2+4x-12}{(x+4)(x+6)} \cdot \frac{(x+6)}{(x-2)(x+6)}$

$\frac{x-2}{x+4}$ ✓

must be illegal move

7. $\frac{4}{x} - \frac{2}{x^2} + \frac{4}{x+3}$ (6 pts)

$\frac{4(x)(x+3)}{x(x)(x+3)} - \frac{2(x+3)}{x^2(x+3)} + \frac{4(x^2)}{(x+3)(x^2)}$

$\frac{(4x)(x+3)-(2x+6)+4x^2}{x^2(x+3)}$

$\frac{4x^2+12x-2x-6+4x^2}{x^2(x+3)}$

$\frac{8x^2+10x-6}{x^2(x+3)} \rightarrow \frac{2(4x^2+5x-3)}{x^2(x+3)}$

(22) doesn't factor nicely

; more (+)

8. $\frac{\frac{3x+2}{(x-1)} + \frac{2}{(x-3)}}{\frac{5x}{(x-3)} - \frac{2x+1}{(x-3)}}$ (6 pts)

$\frac{(3x+2)(x-3)}{(x-1)(x-3)} + \frac{2(x-1)}{(x-3)(x-1)}$

$\frac{5x-(2x+1)}{(x-3)}$

$\frac{3x^2-9x+2x-6+2x-2}{(x-1)(x-3)}$

$\frac{5x-2x-1}{x-3}$

back last sheet →

Solve each of the following equations for x. Circle your answer.

9. $\frac{x-3}{8}=\frac{2x}{3x+7}$ (6 pts)

$\frac{(x-3)(3x+7)}{8(3x+7)}=\frac{2x(8)}{3x+7(8)}$

$3x^2+7x-9x-21=16x$

$-16x \quad -16x$

$3x^2-18x-21=0$

$3(x^2-6x-7)=0$

$x=7$ ✓

$x=-1$ ✓

10. $\frac{6}{x^2-4x+3}-\frac{1}{x-3}=\frac{2}{4x-4}$ (5 pts)

$\frac{6}{(x-3)(x-1)}-\frac{1}{(x-3)}=\frac{2}{4(x-1)}$

$\frac{6(4)}{4(x-3)(x-1)}-\frac{1(x-1)(4)}{4(x-3)(x-1)}=\frac{2(x-3)(x-1)4}{4(x-1)(x-3)}$

$24-(4(x-1))=2x-6$

$24-4x+4=2x-6$

$-2x \quad +6$

$-6x+34=8$

$-34 \quad -34$

$\frac{-6x}{-6}=\frac{-34}{-6}$

$x=5\frac{2}{3}$ ✓

11. $\frac{2(x+7)}{x+4}-2=\frac{2x+20}{2x+8}$ (7 pts)

$\frac{2(x+7)}{x+4}-\frac{2}{1}=\frac{2x+20}{2(x+4)}$

$\frac{2(2)(x+7)}{2(x+4)}-\frac{2(2)(x+4)}{2(x+4)}=\frac{2x+20}{2(x+4)}$

on back

Simplify each of the following expressions completely. Circle your answer.

12. $\frac{x^3-5x^2-14x}{x^2-11x+28}$ (4 pts)

$\frac{x(x^2-5x-14)}{x^2-11x+28}$

$\frac{x(x-7)(x+2)}{(x-7)(x-4)}$

$\frac{x(x+2)}{(x-4)}$ ✓

13. $\frac{3x^2-x-2}{18x+12}$ (3 pts)

$\frac{3x^2-x-2}{6(3x+2)}$

$-1 \cdot -3 \quad -6/2 \quad -1$

	$1x$	-1
$3x$	$3x^2$	$-3x$
$+2$	$2x$	-2

$\frac{(x-1)(3x+2)}{6(3x+2)}$

$\frac{x-1}{6}$ ✓

25

#8

$$\frac{3x^2-5x-8}{(x-1)(x-3)} \div \frac{3x-1}{x-3}$$

$$\frac{3x^2-5x-8}{(x-1)(x-3)} \cdot \frac{x-3}{3x-1}$$

$$\frac{3x^2-5x-8}{(3x-1)(x-1)}$$

-24, -8, 3, -5

	$3x$	-8
x	$3x^2$	$-8x$
$+1$	$3x$	-8

$$\frac{(3x-8)(x+1)}{(3x-1)(x-1)}$$

✓

#11

$$4(x+7) - 4(x+4) = 2x+20$$

$$4x+28-4x-16 = 2x+20$$

$$-2x = 8$$

$$\frac{-2x}{-2} = \frac{8}{-2}$$

$$x = -4$$

extraneous solution

(1)

5.5

Non-calculator Section
6/72 Points

Name Mike P.

Determine the equations of the vertical and horizontal asymptote of the following equations without using your calculator. If one does not exist, write "No Asymptote." (2 pts each)

1. $y = \dfrac{-3x^2}{2x+6}$

Vertical: $x = -3$

Horizontal: no horizontal asymptote

$2x+6=0$
$-6 \quad -6$
$\frac{2x}{2} = \frac{-6}{2}$
$x = -3$

2. $y = \dfrac{3x^2+4x+4}{x^2-5x-6}$ /5

Vertical: $x = 6, -1$

Horizontal: $y = 3$

$x^2-5x-6=0$
$+6 \quad +6$
$x^2-5x=6$

6+U; 4; $16-5(4)=6$ ✗
5; $25-5(5)=6$ ✗
6; $36-5(6)=6$ ✓

$-36+30=6$ ✗
$-6=6$ ✗
doesn't actually work

3. $y = \dfrac{3x+1}{4x^3-32}$

Vertical: $x = 2$

Horizontal: $y = 0$

$4x^3-32=0$
$+32 \quad +32$
$\frac{4x^3}{4} = \frac{32}{4}$
$\sqrt[3]{x^3} = \sqrt[3]{8}$
$x = 2$

$-2^3 = -8$ ✗

IAG IV - Independent Study *Linear Functions*

For the first marking period, you will be studying the concepts of linear equations. The content for each topic is located in your Algebra 2 Textbook. At the end of your studying of these topics, you should be prepared to do the following:

Linear Functions (1.3, 1.5, 1.6, 2.2)	**Linear Functions** (2.3, 2.4, 3.2)
▪ How to solve a linear equations ▪ Use linear equations to solve word problems ▪ How to solve a literal equation ▪ How to solve simple and compound inequalities ▪ How to find the slope of a line	▪ How to find the intercepts of a line ▪ How to find the slope-intercept form of an equation ▪ How to the write the equation of line ▪ How to use algebraic methods to solve linear systems

For the assignments below:

- **Write the section and problem #'s at the top of your paper**
- **Copy the problem**
- ***Show all work***
- **Each section should be a new page**
- **Neatness and organization count**

Assignments are for the following sections:

- Section 1.3: p. 21 - #27, 31, 35, 39, 43
- Section 1.5: p. 35 - #12, 15, 17, 19, 21
- Section 1.6: p. 41 - #21, 24, 23, 27, 29, 31, 37, 40
- Section 2.2: p. 74 - #10, 13, 14, 16, 19, 25, 41
- Section 2.3: p. 81 - #9, 11, 17, 18, 31, 35, 43
- Section 2.4: p. 90 - #11, 13, 17, 19, 30
- Section 3.2: p. 134 - #9, 11, 15, 18, 19, 21, 26, 27

Good Luck.

This assignment is due on: 2/22/07

Name: Michael Plasmeier

Score: 18/23

Section 1.3
Solving Linear Equations

2/4

Independent Study: Linear Functions
p21 - #27, 31, 35, 39, 43

Solve + ✓

27. $\frac{1}{2}x - 12 = 4$
$+12 \quad +12$
$\frac{1}{2}x = 16$
$\frac{\frac{1}{2}x}{\frac{1}{2}} = \frac{16}{\frac{1}{2}}$
$x = 32$

$\frac{1}{2}(32) - 12 = 4$
$4 = 4$ ✓

31. $3(x-2) = 6(5+x)$
$3x - 6 = 30 + 6x$
$+6 \quad +6$
$3x = 36 + 6x$
$-6x \quad -6x$
$\frac{-3x}{-3} = \frac{36}{-3}$
$x = -12$

$3(-12-2) = 6(5+-12)$
$-42 = -42$ ✓

35. $3(x-2) + 6 = 4(2-x)$
$3x - 6 + 6 = 8 - 4x$
$3x = 8 - 4x$
$+4x \quad +4x$
$\frac{7x}{7} = \frac{8}{7}$
$x = 1\frac{1}{7}$ ✓

$3(1\frac{1}{7} - 2) + 6 = 4(2 - 1\frac{1}{7})$
$\frac{24}{7} = \frac{24}{7}$ ✓

39. $-(x+2) - 2x = -2(x+1)$
$-x - 2 - 2x = -2x + -2$
$-3x - 2 = -2x - 2$
$+2 \quad +2$
$-3x = -2x$
$+2x \quad +2x$
$-x = 0$
$x = 0$

Can't ✓ sometimes things work with 0

can't be done

43. You have 2 summer jobs
The first: 40 hrs/week @ $6.25/hour
The second: $5.50/hour for as many hours a week
If you earn $316/week - how long do you work at your 2nd job

$316 = 6.25(40) + 5.50(x)$
$316 = 250 + 5.50(x)$
$-250 \quad -250$
$\frac{66}{5.50} = \frac{5.50(x)}{5.50}$
$x = 12$

12 hours

Section 1.5
Literal Equations + Formulas

2/4

Independent study: Linear Functions
p35 # 12, 15, 17, 19, 21

Solve for that variable

12. Perimeter of rectangle - solve for w

$P = 2l + 2w$

$-2l \quad -2l$

$\frac{2w}{2} = \frac{P-2l}{2}$

$w = \frac{P-2l}{2}$ Simplify "2"

$w = \frac{P}{2} - l$

15. Area trapezoid - solve for b_2

$A = \frac{1}{2}(b_1 + b_2)h$

$\cdot 2 \quad \cdot 2$

$\frac{2A}{h} = \frac{(b_1 + b_2)2h}{2h}$

$\frac{2a}{h} = b_1 + b_2$

$-b_1 \quad -b_1$

$\frac{2a}{h} - b_1 = b_2$

Solve + Evaluate

17. Convert °F → °C - solve for f

$C = \frac{5}{9}(f-32)$

$5/9 \quad 5/9$

$C/5/9 = f - 32$

$+32 \quad +32$

Simplify $\frac{C}{5/9} + 32 = f$

Swap $\frac{9}{5}C + 32 = f$

19. Investment at simple interest - solve for P

$A = P + Prt$ ← P is common factor

$-Prt \quad -Prt$

$P = A - Prt$ $P = \frac{A}{1+rt}$

21. Area of ring $= 2\pi pw$

Solve for p. Find p given $A = 22\,cm^2$, $w = 2\,cm$

$\frac{A}{2\pi w} = \frac{2\pi pw}{2\pi w}$

$p = \frac{A}{2\pi w}$

$p = \frac{22}{2\pi(2)}$

$p = \frac{22}{4\pi}$

$p = 1.750704$

Section 1.6 Solving Linear Inequalities 2/4

(5) whenever ÷ by neg number

Independent Study: Linear Functions
p41 #21, 23, 24, 27, 29, 31, 37, 40

Solve

21. $6+x>11$
$-7 \quad -7$
$6+x>4$
$\frac{}{6} \quad \frac{}{6}$
$x > \frac{2}{3}$

23. $9-k<4$
$-9 \quad -9$
$-k<-5$
flip (5) $k>5$

24. $3-2x \geq 15$
$-3 \quad -3$
$-2x \geq 12$
$\frac{}{-2} \quad \frac{}{-2}$ (5)
$x \leq -6$

27. $-3 \leq x-3 \leq 6$
$+3 \quad +3 \quad +3$
$0 \leq x \leq 9$

29. $4 \leq -3x-1 \leq 9$
$+1 \quad +1 \quad +1$
$5 \leq -3x \leq 10$
$\frac{}{-3} \quad \frac{}{-3} \quad \frac{}{-3}$
$-1\frac{2}{3} \leq x \leq -3\frac{1}{3}$

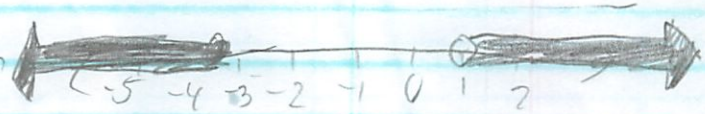
other way → $\frac{-10}{3} \leq x \leq \frac{-5}{3}$

Solve + sketch

31. $-1 < -2x+1 \leq 5$ switch sign
$-1 \quad -1 \quad -1$
$-2 < -2x \leq 4$
$\frac{}{-2}$ (5) $\frac{}{-2}$ (5) $\frac{}{-2}$
$1 > x \geq -2$ → switch order
$-2 \leq x < 1$

37. $m-3>-2$
$+3 \quad +3$
$m>1$

$m+\frac{1}{2} \leq -3$
$-\frac{1}{2} \quad -\frac{1}{2}$
$m \leq -3\frac{1}{2}$

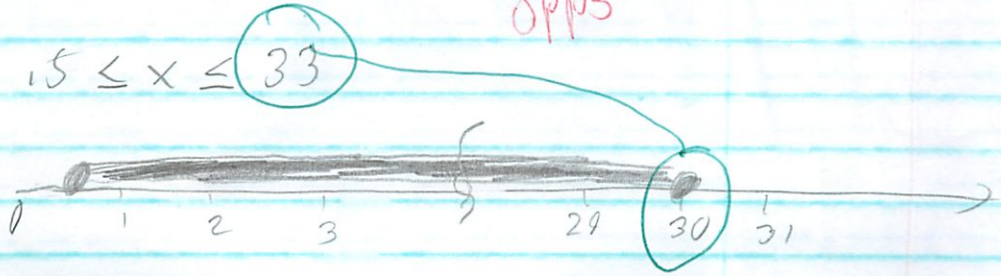


Solve + sketch

40. Longest centipede: 33 cm
Shortest: .5 cm

opps

$.5 \leq x \leq 33$



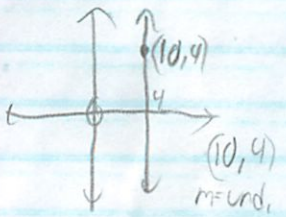
Section 2.2

Slope and Rate of Change 2/4

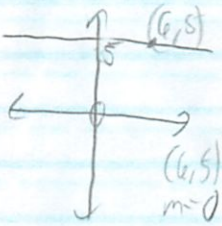
Independent Study: Linear Functions
p 74 #10, 13, 14, 16, 19, 25, 41

Sketch

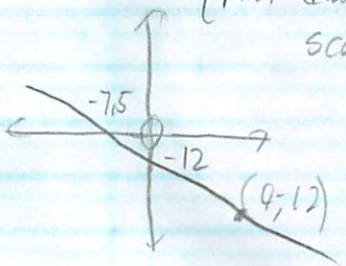
10.



13.

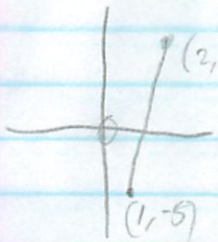


14. (Not drawn to scale)



Sketch + Find Slope

16.

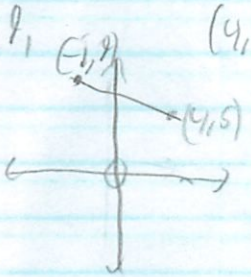


(1,-5)(2,7)

$\frac{7-5}{2-1} = \frac{12}{1}$

slope = 12

19.

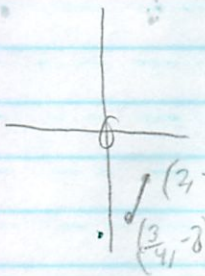


(4,5)(-1,9)

$\frac{9-5}{-1-4} = \frac{4}{-5}$

slope = $-\frac{4}{5}$

25.



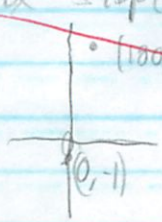
$(\frac{3}{4}, -8)(2, -5)$

$\frac{-8--5}{\frac{3}{4}-2} = \frac{-3}{-1.25}$

slope = 2.4 or $\frac{12}{5}$

41. Leaning Tower was 180 ft tall
One side sunk 1 foot
Causing top 16 ft off center
Approx slope?

not on quiz



$\frac{-16--1}{180-0} \quad \frac{-15}{180}$

slope = $-\frac{1}{12}$ (11.2)

↑
1

Section 2.3

Quick Graphs: Linear Equations 2/9

Independent study: Linear Functions
p81 #9, 11, 17, 18, 31, 35, 43

Find x + y intercepts

9. $3x - 8y = 9$
$3(0) - 8y = 9$
$-8 \quad -8$
$(0, -1.125)$

$\frac{3x}{3} - \frac{8(0)}{3} = \frac{9}{3}$
$(3, 0)$

11. $21x + 7y = -7$
$21(0) + \frac{7y}{7} = \frac{-7}{7}$
$(0, -1)$

$\frac{21x}{21} + \frac{7(0)}{21} = \frac{-7}{21}$
$(-\frac{1}{3}, 0)$

Match Equation w/ graph

17. $2x + 8y = -24$
$-2x \quad -2x$
$8y = -2x - 24$
$y = \frac{-2x - 24}{8}$ → calc + graph
Graph A matches

18. $3x - 6y = 18$
$-3x \quad -3x$
$-6y = -3x + 18$
$y = \frac{-3x + 18}{-6}$ → calc + graph
Matches D

Slope-intercept form

31. $8x + 2y = 1$
$-8x \quad -8x$
$2y = -8x + 1$
$y = \frac{-8x + 1}{2}$
$y = -4x + \frac{1}{2}$
slope = -4
y-int = $(0, \frac{1}{2})$

35. $-x + 2y = -8$
$+x \quad +x$
$\frac{2y}{2} = \frac{x - 8}{2}$
$y = \frac{x}{2} - 4$
slope = $\frac{1}{2}$
y int = $(0, -4)$

Oh well... not a big deal

43. Ladder Safty
Ladder should be $\frac{1}{4}$ of its height from the wall
What is the slope? Why not steeper?

(0, 12) (3, 0)
can't be must be $< 12_{max}$
$\frac{12 - 0}{0 - 3}$ slope = -4
can't be
If it was steeper - might tip backwards and fall on top of ya

Section 2.4

Writting Equations of Lines 2/4

Independent Study: Linear Functions
p90 # 11, 13, 17, 19, 30

Write equation

11. $(0,3)$ $m=-\frac{1}{2}$

$y=-\frac{1}{2}x+3$

13. $(-8,1)$ $m=10$

$y=10x$ = $y=80$ at -8 so $+10+1$

$y=10x+81$

Write Equation

17. $(7,6)$ $(10,5)$

$\frac{6-5}{7-10}=\frac{1}{-3}=m$ copy error

$y=-\frac{1}{3}$ at $7=-2\frac{1}{3}$ so $+2\frac{1}{3}+6$

$y=-\frac{1}{3}x+8\frac{1}{3}$

$y=3x-15$

19. $(-9,9)$ $(0,1)$

$\frac{9-1}{-9-0}=\frac{8}{-9}$

$y=-\frac{8}{9}x+1$

forgot x

30. Running the IRS

Using chart, write linear model for adv. cost of running IRS
Let $t=0$ be cost in 1980 and estimate cost in 1995

0, 2.3
5, 5
10, 5.5

stat edit → $y=.325x+2.31$

$y=.325(15)+2.31$ ← in 1995

$y=7.19$ billion $

Section 3.2

Solving Linear Systems Algebraically 2/4

Independent Study: Linear Functions
p134 # 9, 11, 15, 18, 19, 21, 26, 27

9. Use subtraction + solve

$x + 9y = 25$
$6x - 5y = 3$

$-9y \quad -9y$

$x = 25 - 9y$

$6(25 - 9y) - 5y = 3$

$150 - 54y - 5y = 3$

$-150 \quad -150$

$\frac{-59y}{-59} = \frac{-147}{-59}$

$y = 2.4915$

$x + 9(2.4915) = 25$
$-22.4237 \quad -22.4237$

$x = 2.5762$

(-2, -3)

11. (error)

$2x + 3y = -6$
$3x + 2y = 25$

$\frac{3y}{3} = \frac{-2x - 6}{3}$

$y = -\frac{2}{3}x - 2$

$3x + 2(-\frac{2}{3}x - 2) = 25$

$3x - \frac{4}{3}x - 4 = 25$
$+4 \quad +4$

$\frac{1\frac{2}{3}x}{1\frac{2}{3}} = \frac{29}{1\frac{2}{3}}$

$x = 17.4$

know both ways

$3(17.4) + 2y = 25$
$-52.2 \quad -52.2$

$\frac{2y}{2} = \frac{-27.2}{2}$

$y = -13.6$

$(\frac{87}{5}, \frac{-68}{5})$

Solve w/ linear combination

15. $3x + 11y = 4$
$-2x - 6y = 0$

15($-3x - 9y = 0$

$\frac{2x}{2} = \frac{4}{2}$

$x = 2$

$3x + 11(2) = 4$
$-22 \quad -22$

$\frac{3x}{3} = \frac{-18}{3}$

$x = -6$

18. $2x - y = 3$
$4x - 6y = -6$ ·(-6)

$-12x + 6y = -18$

$\frac{-3x}{-3} = \frac{-12}{-3}$

$x = 4$

$2(4) - y = 3$
$-8 \quad -8$

$-y = -5$

$y = 5$

→

Sketch + Solve

19. $x - y = 10$
$3x - 2y = 25$

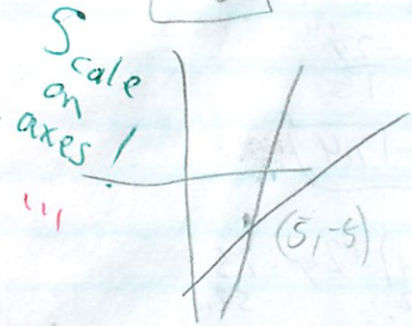
$+y \quad +y$
$x = 10 + y$

$3(10+y) - 2y = 25$
$30 + 3y - 2y = 25$
$-30 \quad -30$

$\boxed{y = -5}$

$x - (-5) = 10$
$-5 \quad -5$

$\boxed{x = 5}$



21. $4x + 3y = -1$
$-3x - 6y = -3$ ·2
$8x + 12y = 2$

$\frac{5x}{5} = \frac{5}{5}$

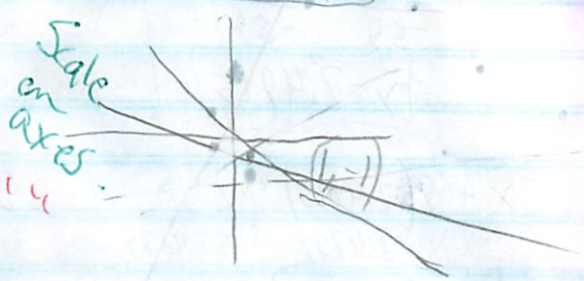
$\boxed{x = 1}$

$4(1) + 3y = -1$
$-4 \quad -4$

$\frac{3y}{3} = \frac{-5}{3}$

$\boxed{y = -\frac{5}{3}}$

was a mental division error



How many solutions

26. $6x - y = 5$
$12x - 2y = 3$ ·2
$12x - 2y = 10$

can't be done

0 solutions

27. $x - 2y = 1$
$3x - 6y = 2$ ·3
$3x - 6y = 3$

can't be done

0 solutions

Both have 2 different integers equal to some equation half.

All when $0 = 0$
or $3 = 0$

Derived equation is false

6/4

Name: Michael Plosmeier 43/46 **Equations (all kinds)**

Directions: Show all work that is necessary to receive credit. This QUIZ is worth **46 points.** Good Luck.

Solve the problems below:

1. $|7r+3|<11$ Answer: $-2<r<\frac{8}{7}$ **[4 points]**

$-11<7r+3<11$

$-14<7r<8$

$-2<r<\frac{8}{7}$

2. $\left|\frac{1}{4}x-9\right|=6$ Answer: x=60 x=12 **[4 points]**

$\frac{1}{4}x-9=-6$

$\frac{1}{4}x=15$ $\frac{1}{4}x=3$

x=60 x=12

3.
$2x+2y-6z=-6$
$x+y-2z=0$
$-2x-y+8z=19$

Answer: x=-1, y=7, z=3 **[5 points]**

$-x-y+3z=3$

z=3

$y+2z=13$

$y+2(3)=13$

y=7

$x+(7)-2(3)=0$

x=-1

13

Name: _____ *Equations (all kinds)*

4. $\frac{2}{3}x^2 + 6 = 18$

$-6 \quad -6$

$\frac{2}{3}x^2 = 12$

$\times \frac{3}{2} \quad \times 1.5$

$x^2 = 18$

$\sqrt{\quad} \quad \sqrt{\quad}$

$x = \pm\sqrt{18}$

$x = \pm\sqrt{9}\sqrt{2}$

$x = \pm 3\sqrt{2}$

Answer: $\pm 3\sqrt{2}$ **[3 points]**

Use the quadratic formula to solve the equations below.

$$\frac{-b \pm \sqrt{b^2-4ac}}{2a}$$

5. $2x^2 - 6x - 5 = 0$

$$\frac{-(-6) \pm \sqrt{(-6)^2 - 4(2)(-5)}}{2(2)}$$

$$\frac{6 \pm \sqrt{76}}{4} \rightarrow \frac{3 \pm \sqrt{19}}{2}$$

Answer: _____ **[5 points]**

$x = 3.6794$

$x = -.6794$

6. $4x - 2 = -3x^2 + 3x$

$+3x^2 \quad -3x \qquad +3x^2 \quad -3x$

$3x^2 + x - 2 = 0$

$$\frac{-(1) \pm \sqrt{(1)^2 - 4(3)(-2)}}{2(3)}$$

$$\frac{-1 \pm \sqrt{25}}{6}$$

$x = \frac{2}{3} \quad x = -1$

Answer: _____ **[5 points]**

7. $7x^2 - 4 - x = 6x^2 - 10$

$-6x^2 \quad +10 \qquad -6x^2 \quad +10$

$x^2 - x + 6 = 0$

$$\frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(6)}}{2(1)}$$

$$\frac{1 \pm \sqrt{-23}}{2} \qquad \frac{1 \pm i\sqrt{23}}{2}$$

Answer: _____ **[5 points]**

$x = 2.8979i$

$x = -1.8979i$

Name: _____ *Equations (all kinds)*

Solve the equation. Check for extraneous solutions.

8. $\sqrt{3t+1} = \sqrt{t+15}$

Answer: $t=7$ [3 points]

$(\sqrt{\ })^2 \quad (\sqrt{\ })^2$

$3t+1 = t+15$

$-t \quad -1 \quad -t \quad -1$

$\frac{2t}{2} = \frac{14}{2}$

$t=7$

Check: $\sqrt{3(7)+1} = \sqrt{(7)+15}$

Factor completely. Find all real-number solutions.

9. $x^3 + 2x^2 - x = 2$

Answer: _____ [4 points]

$-2 \quad -2$

$x^3 + 2x^2 - x - 2$

GCF

$(x^3 - x) + 2x^2 - 2$

$x(x^2 - 1) + 2x^2 - 2$

$(x-1)(x^2+2x+1) + 2(x^2-1)$

$(x-1)(x+1)(x+1) + 2(x^2-1)$

$(x-1)(x+1)^2 + 2(x^2-1)$

$(x-1)(x^2+2x+1) + 2(x^2-1)$

$x^3 + 2x^2 + x - x^2 - 2x - 1 + 2x^2 - 2$

$x^3 + 2x^2 - x - 3$

$(x^3 - x) + (2x^2 - 2) - 3$

$x(x^2-1) + 2(x^2-1) - 3$

$x(x+1)(x-1) + 2(x+1)(x-1) - 3$

$(x+1)(x-1)(x+2) - 3$

$(x^2-1)(x+2) - 3$

$x^3 + 2x^2 - x - 2 - 3$

$x^3 + 2x^2 - x - 5$

$x^3 + 2x^2 - x - 2$

$x^3 + 2x^2 - x = 2$

$x = -1, 0, 1$ (Extraneous)

10. $x^2 + 3x = 10$

Answer: $x=2, x=-5$ [3 points]

$+(3/2)^2 \quad +(3/2)^2$

$x^2 + 3x + 2.25 = 12.25$

$(x+1.5)^2 = 12.25$

$\sqrt{\ } \quad \sqrt{\ }$

$x + 1.5 = \pm\sqrt{12.25}$

$-1.5 \quad -1.5$

$x = \pm 3.5 - 1.5$

Solve the equation below.

11. $\frac{6}{x-1} + \frac{2x}{x-2} = 2$

Answer: $x=1.6$ [5 points]

$\frac{6(x-2)}{(x-1)(x-2)} + \frac{2x(x-1)}{(x-2)(x-1)} = \frac{2(x-1)(x-2)}{(x-1)(x-2)}$

$6x - 12 + 2x^2 - 2x = 2(x^2 - 2x - 1x + 2)$

$2x^2 + 4x - 12 = 2x^2 - 6x + 4$

$-2x^2 \quad +6x \quad +12 \quad -2x^2 \quad +6x \quad +12$

$10x = 16$

$10 \quad 10$

$x = \frac{8}{5}$ or 1.6

$2(x)(x+1) + 2(x+1)(x-1)$

$2=0$ ⊗ $\quad x=0 \quad x+1=0,\ x=-1 \quad 2=0$ ⊗ $\quad x+1=0,\ x=-1 \quad x-1=0,\ x=1$

$(0)^3+2(0)^2-(0)=2$ ⊗ Extranious

$(-1)^3+2(-1)^2-(-1)=2$ ✓

$(1)^3+2(1)^2-(1)=2$ ✓

$x^{\frac{2}{3}}=0$

$\sqrt[3]{x^2}=0$

$x^2=0$

$x=\pm 0$

Writing Inverses

6/4

Inverse - In an equation, the inverse is a set of ordered pairs obtained by switching the coordinates of each ordered pair

ex $(0,-3)\ (1,-1)\ (2,1)\ (3,3)\ (4,5)$ ← relation
$(-3,0)\ (-1,1)\ (1,2)\ (3,3)\ (5,4)$ ← inverse

ex2 ← write inverse $f(x)$

$y = 2x + 3$ $\quad f^{-1}(x)$

x	y
-2	-1
-1	1
0	3
1	5
2	7
3	9

x	y
-1	-2
1	-1
3	0
5	1
7	2
9	3

ex3 $f(x) = 7(x-3) \rightarrow y = 7(x-3)$

find $f^{-1}(x)$ $\quad x = 7(y-3)$

$x = 7y - 21$

$+21 \quad +21$

$x + 21 = 7y$

$\frac{x}{7} + 3 = y = f^{-1}(x)$

x	y
-1	2.85
0	3
1	3.14
2	3.28

ex3

$f(x) = 4x^3 + 3$

$x = 4y^3 + 3$

$-3 \quad -3$

$\frac{x-3}{4} = \frac{4y^3}{4}$

$\sqrt[3]{\frac{x-3}{4}} = \sqrt[3]{y^3}$

$y = \sqrt[3]{\frac{x-3}{4}}$

NAME _____ CLASS _____ DATE _____

Practice
2.5 Inverses of Functions

Find the inverse of each relation. State whether the relation is a function and whether its inverse is a function.

1. $\{(-1, -16), (0, -6), (2, 14)\}$

2. $\{(7, 2), (6, 3), (2, 4), (6, 5)\}$

3. $\{(-2, 16), (-1, 1), (1, 1), (2, 16)\}$

4. $\{(-3, 7), (-3, 7), (-1, 7), (3, 7)\}$

5. $\{(-5, 4), (-3, 9), (1, 12), (7, 13)\}$

For each function, find the equation of its inverse. Then use composition to verify that the equation you wrote is the inverse.

6. $f(x) = \frac{1}{3}(x + 1)$

7. $h(x) = \frac{2x+1}{3}$

8. $g(x) = 11x - 4$

9. $f(x) = \frac{1}{2}(x - 2.5)$

10. $g(x) = 5(x + 2)$

11. $h(x) = \frac{3}{4} - 8$

Graph each function, and use the horizontal-line test to determine whether the inverse is a function.

12. $f(x) = x^2 + 1$

13. $g(x) = x^3 + 1$

14. $h(x) = x^3 + x$

NAME _____ CLASS _____ DATE _____

Reteaching
2.5 Inverses of Functions

Skill A Finding inverses of functions

Recall The inverse of a relation is found by interchanging x and y and then solving for y.

- **Example 1**
  Find the inverse of the function given by {(2, 7), (5, 13), (7, 19), (9, 25)}. Tell whether the inverse relation is a function.
- **Solution**
  Interchange x and y. {(7, 2), (13, 5), (19, 7), (25, 9)}
  The inverse is a function because there is only one y-value for each x-value.
- **Example 2**
  Find the inverse, f^{-1}, of $f(x) = 2x + 5$. Then find $f(f^{-1}(x))$ and $f^{-1}(f(x))$.
- **Solution**

Replace $f(x)$ with y.	$y = 2x + 5$
Interchange x and y.	$x = 2y + 5$
Solve for y.	$x - 5 = 2y$
	$\frac{x-5}{2} = y$
	$y = \frac{1}{2}x - \frac{5}{2}$

$f(f^{-1}(x)) = f\left(\frac{1}{2}x - \frac{5}{2}\right)$

$= 2\left(\frac{1}{2}x - \frac{5}{2}\right) + 5$

$= x - 5 + 5$

$= x$

$f^{-1}(f(x)) = f^{-1}(2x + 5)$

$= \frac{1}{2}(2x + 5) - \frac{5}{2}$

$= x + \frac{5}{2} - \frac{5}{2}$

$= x$

Find the inverse, $f^{-1}(x)$, of each function. Then find $f(f^{-1}(5))$ and $f^{-1}(f(5))$.

1. $f(x) = \{(-5, -3), (0, 3), (3, 5), (5, 6)\}$

   $f^{-1}(x)$ _____

   $f(f^{-1}(5)) =$ _____ $f^{-1}(f(5)) =$ _____

2. $f(x) = \frac{1}{2}x - 3$

   $f^{-1}(x)$ _____

   $f(f^{-1}(5)) =$ _____ $f^{-1}(f(5)) =$ _____

3. $f(x) = 7x + 4$

   $f^{-1}(x) =$ _____

   $f(f^{-1}(5)) =$ _____ $f^{-1}(f(5))$ _____

4. $f(x) = \frac{2x+1}{5}$

   $f^{-1}(x) =$ _____

   $f(f^{-1}(5)) =$ _____, $f^{-1}(f(5))$ _____

Equation Review

6/5

1. $6x - y + 18 = 0$ ↓ Find x + y intercept

$6(0) - y + 18 = 0$ set $x = 0$, find y
$-18 \quad -18$ set $y = 0$, find x

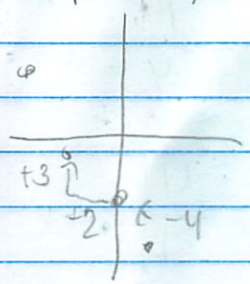
$-y = -18$

$(0, 18)$

$6x - (0) + 18 = 0$ → $\frac{6x}{6} = \frac{-18}{6}$

-18 $(-3, 0)$

2. Graph $y = -\frac{3}{2}x - 4$



3. Calc Slope

$(4, 5)$
$(-1, 9)$ $\frac{\Delta y}{\Delta x} = \frac{9-5}{-1-4} = \frac{4}{-5}$

4. $(-12, -9)$
$(1, -8)$ $\frac{-9 - -8}{-12 - 1} = \frac{-1}{-13} \quad \frac{1}{13}$

5. $(-15, 8)$
$(-9, \frac{1}{2})$ $\frac{8 - \frac{1}{2}}{-15 - -9} \quad \frac{7\frac{1}{2}}{-6} \quad \frac{\frac{15}{2}}{-6}$

$\frac{15}{2} \cdot \frac{1}{-6} \quad \frac{15}{-12} \rightarrow \left(\frac{5}{-4}\right)$

6. $(-2, -4)$
$m = 4/5$ Substitute $-4 = \frac{4}{5}(-2) + b$

$-4 = -1.6 + b$
$+1.6 \quad +1.6$
$-2.4 = b$

$y = \frac{4}{5}x + 5.6$

7. $(4,-2)$
$(-2,0)$

$\frac{-2-0}{4--2} = \frac{-2}{6} = -\frac{1}{3}\ m$

$0 = -\frac{1}{3}(-2) + b$

$0 = \frac{2}{3} + b$

$-\frac{2}{3} \quad -\frac{2}{3}$

$-\frac{2}{3} = b$

$y = -\frac{1}{3}x - \frac{2}{3}$

8. $(4,-4)$
$(-16,1)$

$\frac{-4-1}{4--16} = \frac{-5}{20} = \frac{1}{4}$

$(1,5)$
$(5,21)$

$\frac{21-5}{5-1} = \frac{16}{4} \quad \frac{4}{1}$

~~Slope Small World~~ Name Michael Plasmeier

Date

Sketch the line thru A and B, and find its slope m.

1) A(-3, 2) B (5, -4) no intercepts

2) A (4, -1) B (-6, -3)

3) A (2, 5) B (-7, 5)

4) A (5 , -1) B (5 , 6)

See other sheet

Sketch the graph of the line through point P and having the slope m.

5) P (3 , 1) m= 1/2

6) P (-2 ,4) m= -1/5

Find the equation of the line with the given conditions.

7) Point (5 , -2) and parallel to y-axis $x=5$ undefined

8) Point (-4 , 2) and perpendicular to x- axis $x=-4$ undefined can do $x=$

9) Thru the point (5 , -3) and m= -4 $-3=-4(5)+b$ $y=-4x+17$ add error

10) Thru the point (4,0) and m= 2/3 $0=\frac{2}{3}(4)+b$ $y=\frac{2}{3}x-\frac{8}{3}$

11) Thru the two points: Point (4 , -5) Point (-3 , 6) $\frac{6-5}{-3-4}=\frac{11}{-7}=m$ $6=-3\left(\frac{11}{-7}\right)+b$ $y=-\frac{11}{7}x+\frac{9}{7}$

12) Thru the point (4 , -5) and x-intercept 5 ((5,0)) $\frac{-5-0}{4-5}=\frac{-5}{-1}=5$ $-5=4(5)+b$ $y=5x-25$

Use mixed #s

13) Thru the point (2 , -4) and parallel to the line 5x - 2y = 4 $-4=2(2.5)+b$ $y=2.5x-9$ $-2y=4-5x$ $m=2.5=\frac{5}{2}$

14) Thru the point (-3 , 4) and perpendicular to the line 2x - 5y = 8 $4=-\frac{5}{2}(-3)+b$ $y=-\frac{5}{2}x+3.5$ $-5y=8-2x$ $m_1=\frac{2}{5}\rightarrow m=-\frac{5}{2}$

15) X intercept = 4 and y intercept = -3 (4,0) $\frac{-3-0}{0-4}=\frac{3}{4}$ (0,-3) $y=\frac{3}{4}x-3$

16) The perpendicular bisector of the segment thru the points (3 , -1) and (-2 , 6) $\frac{6-(-1)}{-2-3}=\frac{7}{-5}\rightarrow\frac{5}{7}$ $-1=\frac{5}{7}(3)+b$ $-2.14=2.14$ $y=\frac{5}{7}x+\frac{22}{7}$ goes through middle of points $\left(\frac{-2+3}{2},\frac{6+(-1)}{2}\right)$ $\left(\frac{1}{2},\frac{5}{2}\right)$ $y=\frac{5}{7}x+\frac{15}{7}$

17) The line that bisects the first and third quadrants. $y=x$ plug $\frac{5}{2}=\frac{5}{7}\left(\frac{1}{2}\right)+b$ $b=\frac{5}{14}$

Sketch each of the following lines.

See other sheet

18) $2x=15-3y$ -15 $\frac{-3y}{-3}=\frac{2x-15}{-3}$ $y=-\frac{2}{3}x+5$

19) $4x-3y=9$ $-4x$ $\frac{-3y}{-3}=\frac{-4x+9}{-3}$ $y=\frac{4}{3}x-3$

20) $x-5y=-15$ $-x$ $\frac{-5x}{-5}=\frac{-x-15}{-5}$ $x=+\frac{1}{5}x+3$ $\ominus\div\ominus=\oplus$

Small World
Slope Worksheet

6/4

1. $(-3, 2)$ $(5, -4)$

$\frac{-6}{8}$, $-\frac{3}{4}$

to find y-intercept - plug in

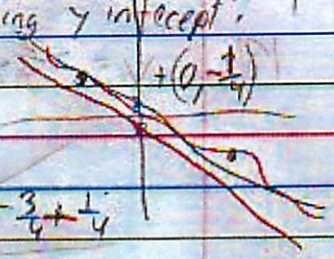
$2 = -\frac{3}{4}(-3) + b$

$-2.25 \quad -2.25$

$-\frac{1}{4} = b$

finding y intercept: $(0, -\frac{1}{4})$

$y = -\frac{3}{4} + \frac{1}{4}$



2. $(4, -1)$ $(-6, -3)$

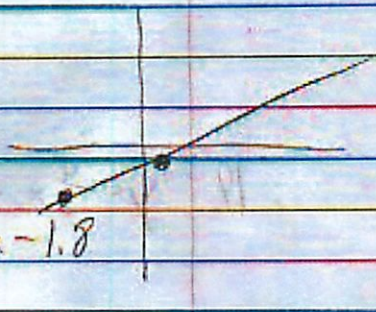
$\frac{-2}{-10}$, $\frac{1}{5}$

$-1 = \frac{1}{5}(4) + b$

$-1 \quad -.8$

$-1.8 = b$

$y = \frac{1}{5}x - 1.8$



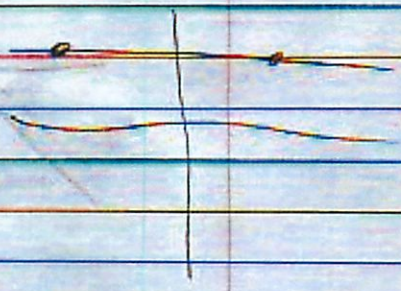
3. $(2, 5)$ $(-7, 5)$

$\frac{5-5}{-7-2} = \frac{0}{-9} = 0$

$5 = 2(0) + b$

$5 = b$

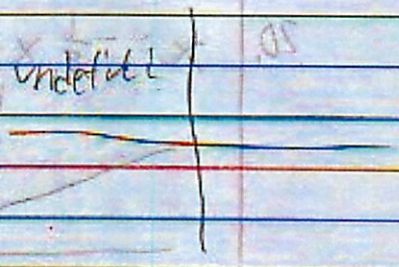
$y = 5$



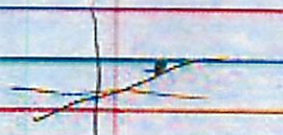
4. $(5, -1)$ $(5, 6)$

$\frac{6 - -1}{5-5}$ error

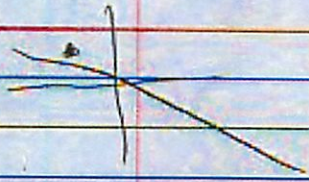
undefined



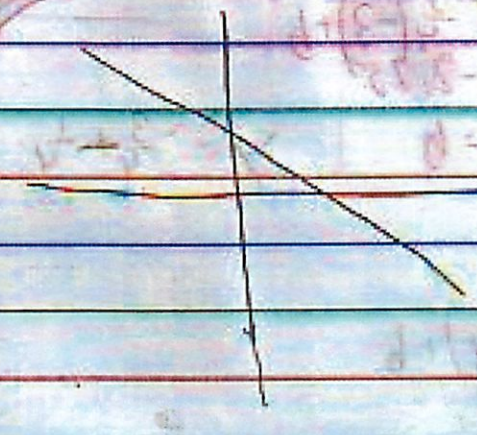
5. $(3, 1)$ $m = \frac{1}{2}$



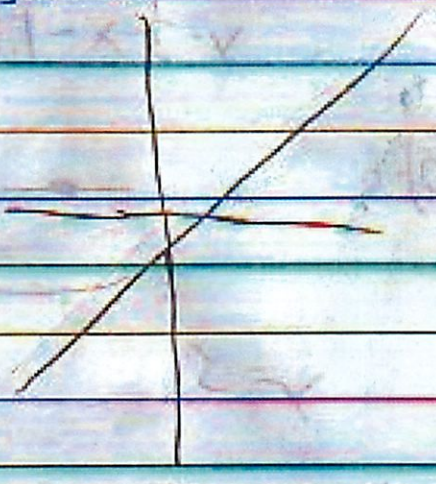
6. $(-2, 4)$ $m = -\frac{1}{5}$



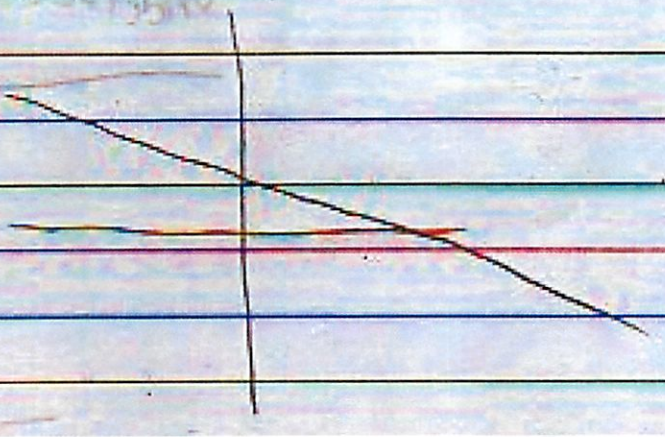
18. $y = -\frac{2}{3}x + 5$



19. $y = \frac{4}{9}x - 3$



20. $x = -\frac{1}{5}x + 7$



Writing Equations for Parallel + Perpendicular Lines

6/6

Parallel lines - have the same slopes

perpendicular lines - the slopes are negative reciprocals $(-a^{-1})$

1. Write equation of line parallel to $y = \frac{3}{4}x + 6$ + through point $(-2, 5)$
   - same slope
   - solve for y intercept

   $y = \frac{3}{4}x + 6.5$ ($6.5 = \frac{13}{2}$) → $5 = \frac{3}{4}(-2) + b$

   $+1.5 \quad +1.5$

   $6.5 = b$

2. Line goes through $(10, 1)$ parallel to $(3, -5)$ $(-2, 13)$

   $\frac{13 - -5}{-2 - 3} = \frac{18}{-5}$ → $1 = -\frac{18}{5}(10) + b$

   $+36 \quad +36$

   $b = 37$

   $y = -\frac{18}{5}x + 37$

3. Line through $(3, 4)$ - perp to $(-12, -9)$ $(1, -8)$

   $\frac{-9 - -8}{-12 - 1} = \frac{-1}{-13}$ → $\frac{1}{13}$ ($-a^{-1}$) → $\frac{-13}{1}$ → -13 ($= m_\perp$)

   $4 = (3) - 13 + b$

   $+39 \quad +39$

   $43 = b$

   $y = -13x + 43$

4. y intercept of 1 and perp to $2x - 4y = 7$

   $-2x \qquad -2x$

   $\frac{-4y}{-4} = \frac{-2x + 7}{-4}$

   $y = \frac{1}{2}x + \frac{7}{-4}$

   $y = -2x + 1$

   $-a^{-1}$ → -2

Parallel or Perpendicular

6/6

- Show the work to be able to state whether the lines are parallel, perpendicular or neither.

① L_1: $(1,7)$ & $(-3,-5)$
L_2: $(-6,-20)$ & $(0,-2)$

② L_1: $(4,-4)$ & $(-16,1)$
L_2: $(1,5)$ & $(5,21)$

③ L_1: $(3,-13)$ & $(22,4)$
L_2: $(6,2)$ & $(-8,9)$

- Complete the following:

④ Write the equation of the line that is parallel to $y=-2x+5$ and passing through $(3,6)$

⑤ Write the equation of the line that is parallel to $y=\frac{2}{3}x-4$ and passing through $(-1,-10)$

⑥ Write the equation of the line that is parallel to $2x-y=-8$ and passing through $(5,0)$

⑦ Write the equation of the line that is perpendicular to $y=\frac{1}{3}x-7$ and passing through $(4,$ $(4,-6)$

⑧ Write the equation of the line that is perpendicular to $y=\frac{-2}{5}x+6$ and passing through $(-2,-1$

⑨ Write the equation of the line that is perpendicular to $8x+4y=-7$ and passing through $(-6,$

Parallel or Perpendicular Worksheet

6/6

1. $(1,7)(-3,-5)$ $(-6,-20)(0,-2)$

$\frac{7--5}{1--3} = \frac{12}{4} = 3$ $\quad \frac{-20--2}{-6-0} = \frac{-18}{-6} = 3$

parallel

2. $(4,-4)(-16,1)$ $(1,5)(5,2)$

$\frac{1--4}{-16-4} = \frac{5}{-20} = -\frac{1}{4}$ $\quad \frac{2-5}{5-1} = -\frac{16}{4}$

perpendicular

3. $(3,-13)(22,4)$ $(6,2)(-8,9)$

$\frac{4--13}{22-3} = \frac{17}{19}$ $\quad \frac{9-2}{-8-6} = \frac{7}{-14}$ neither

4. $(3,6)$ parallel to $y=-2x+5$

$6 = -2(3)+b$

$+6 \quad +6$

$b=12$

$y=-2x+12$

5. $(-1,-10)$ parallel to $y=\frac{2}{3}x-4$

$-10 = \frac{2}{3}(-1)+b$

$+\frac{2}{3} \quad +\frac{2}{3}$

$b=-\frac{28}{3}$

$y=\frac{2}{3}x-\frac{28}{3}$

6. $(5,0)$ parallel to $2x-y=-8$

$-2x \quad -2x$

$\frac{-y}{-1} = \frac{-2x-8}{-1}$

$y=2x-8$

$0=2(5)+b$

$-10 \quad -10$

$b=-10$

$y=2x-10$

7. $(4,-6)$ perpendicular to $y=\frac{1}{3}x-7$

$-6=-3(4)+b$

$+12 \quad +12$

$6=b$

$y=-3x+6$

8. $(-2,-1)$ perpendicular to $y = -\frac{2}{5}x + 6$

$-1 = \frac{5}{2}(-2) + b$

$+5 \quad +5$

$b = 4$

$y = \frac{5}{2}x + 4$

9. $(-6,9)$ perpendicular to $8x + 4y = -7$

$-8x \quad -8x$

$\frac{4y}{4} = \frac{-8x - 7}{4}$

$y = -2x - \frac{7}{4}$

$9 = \frac{1}{2}(-6) + b$

$+3 \quad +3$

$b = 12$

$y = \frac{1}{2}x + 12$

Return of the Rescue (10)

Small World Unit

6/7

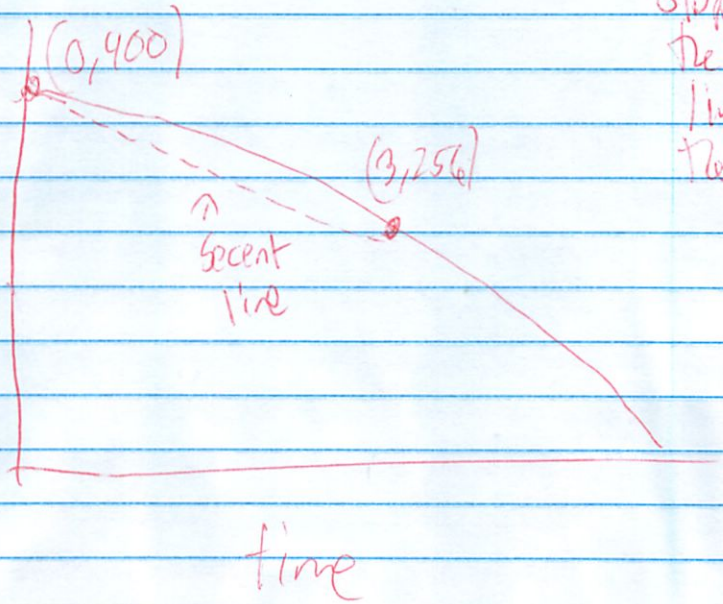
$y = 400 - 16t^2$

1. $y = 400 - 16(3)^2$
   $y = 256$ ft

2. $400 - 256 = 144$ ft

3. $\frac{144}{3} = 48$ ft/s Distance traveled / time elapsed

4. $0 = 400 - 16t^2$
   $t = 5$



Slope of the secent line represents the avg speed

Instant of Impact p313 - (IAG 3)

6/7

1. $y = 400 - 16t^2$

1. $400 - 16(3)^2 = 256$ $\quad 256 - 0 = 256$ ft
$400 - 16(5)^2 = 0$

b. $\frac{256}{2} = 128$ ft/sec

2. $400 - 16(4)^2 = 144$ $\quad 144 - 0 = 144$ ft
$400 - 16(5)^2 = 0$

b. $\frac{144}{1} = 144$ ft/sec

3. $400 - 16(4.5)^2 = 76$ $\quad 76 - 0 = 76$ ft
$400 - 16(5)^2 = 0$

b $\frac{76}{.5} = 152$ ft/sec

4. $400 - 16(4.9)^2 = 15.84$ $\quad 15.84 - 0 = 15.84$ ft
$400 - 16(5)^2 = 0$

$\frac{15.84}{.1} = 158.4$ ft/sec

@ a little above below

I do it the other way

5. $400 - 16(4.999)^2 = .159984$ $\quad .159984 - -.160016$
$400 - 16(5.001)^2 = -.160016$ $\quad = .32$

So slope is negitive

$\frac{.32}{.002} = 160$ ft

Photo Finish
p315 (IAS 3)

6/7

$y = .1t^2 + 3t$

1. $400 = .1t^2 + 3t$ ↓ I solved for t, when I imputed how many meters she should run
   $400 \quad -400$
   $.1t^2 + 3t - 400 = 0$
   $x = 50, -80$
   It took her 50 seconds

2. $.1(49.99)^2 + 3(49.99) = 399.87001$ $\quad \frac{400.13001 - 399.87001}{50.01 - 49.99}$
   $.1(50.01)^2 + 3(50.01) = 400.13001$
   $\frac{.26}{.02} = 13$ m/sec
   Show

3. $.1(7.99)^2 + 3(7.99) = 30.35401$ $\quad \frac{30.44601 - 30.35401}{8.01 - 7.99}$
   $.1(8.01)^2 + 3(8.01) = 30.44601$
   8
   $\frac{.092}{.02} = 4.6$ m/sec
   27
   35
   $.1(26.99)^2 + 3(26.99) = 153.81601$ $\quad \frac{153.98401 - 153.81601}{27.01 - 26.99}$
   $.1(27.01)^2 + 3(27.01) = 153.98401$
   $\frac{.168}{.02} = 8.4$ m/s
   $.1(34.99)^2 + 3(34.99) = 227.40001$ $\quad \frac{227.60001 - 227.40001}{35.01 - 34.99}$
   $.1(35.01)^2 + 3(35.01) = 227.60001$
   $\frac{.2}{.02} = 10$ m/s

b. Yeah - 35 sec in to the race?

Doctors Orders (11)

6/7

$y = 64 - 16t^2$ $\quad v < 60$ ft/sec

1. $y = 64 - 16(1)^2$
   $y = 48$ ft

2. $0 = 64 - 16t^2$
   Quadratic formula
   $x = 2, -2$
   $t = 2$ seconds

3. $64 - 16(1)^2 = 48 \quad 48 - 0 = 48$ ft
   $64 - 16(2)^2 = 0$
   $\frac{48}{1} = 48$ ft/sec

4. $64 - 16(1.5)^2 = 28 \quad 28 - 0 = 28$ ft
   $64 - 16(2)^2 = 0$
   $\frac{28}{.5} = 56$ ft/sec

5. $64 - 16(1.99)^2 = .6384 \quad -.6416 - .6384$
   $64 - 16(2.01)^2 = -.6416 \quad 2.01 - 1.99$
   $\frac{-1.28}{.02} = 64$ ft/sec

No, he will break his doctor's orders

Growth Oil Slick (13)

6/7

$y = \pi(70+6t)^2$

1, 2) $y = \pi[70+6(2)]^2 = 21124.069$

$\pi[70+6(0)]^2 = 15393.80$

$\frac{21124.069 - 15393.80}{2-0} = \frac{5730.269}{2} = 2865\ m^2/hr$

2b) $\pi(70+6(.5))^2 = 16741$ $\quad \frac{16741-15393}{.5} \quad \frac{1348}{.5} = 2696\ m^2/hr$

$\pi(70+6(0))^2 = 15393.$

2c) $\pi(70+6(-.25))^2 = 14741$ $\quad \frac{14741-15393}{0--.25} = \frac{-652}{.25}$

$\pi(70+6(0))^2 = 15393$

$2608\ m^2/hr$

more exact ↳ $2610.64\ m^2/hr$

3. $\pi(70+6(-.01))^2 = 15367.425934$ $\quad \frac{15420.2046906-15367.4...}{.01--.01}$

$\pi(70+6(.01))^2 = 15420.2046906$

$\frac{52.7787566}{.02} = 2638\ m^2/hr$

↳ .938

give more exact

To find the instantaneous rate of change *If only given the equation!

Use a symmetrical interval around the desired x-value & find the corresponding y-value. Then find the slope.

Speed + Slope (12)

6/8

Part 2

1. $(0, 420\text{ mm})$ $(3, 438\text{ mm})$ -3 $\nearrow -18$ $\frac{-18}{-3} = 6$ mm/hr

$y = 6t + 420$

2. $+8$ $\searrow (5, -8)$ $\rightarrow +12$ $(13, 4)$ $\frac{12}{8} = \frac{3}{2}$

$-8 = \frac{3}{2}(5) + b$

$-7.5 \quad -7.5$

$-15.5 = b$

$y = \frac{3}{2}x - \frac{31}{2}$

Zoom p317

6/8

$y = .1t^2 + 3t$

1. $\frac{400.02766 - 399.97234}{50.002128 - 49.997872}$

b. $\frac{.05532}{.004256} = 12.9981203$ m/sec

2. This is another way to very closly approximate her speed when she finishes the race.

Derivative - at a point, the derivative is the same as the slope of the line that is tangent to the graph at that point.

If given only the graph

To find the instantious rate of change

Draw a tangent line, choose 2 points on the line & find their slope

Speeds, Rates, Derivatives (14)

6/8

1. $y = 400 - 16t^2$

a) $400 - 16(2.99)^2 = 256.9584$

$400 - 16(3.01)^2 = 255.0384$

$$\frac{255.0384 - 256.9584}{3.01 - 2.99}$$

$$\frac{-1.92}{.02} = 96 \text{ ft/sec}$$

b) This is the instantaneous speed which the bundle is falling after 3 seconds.

2. $y = \pi(70 + 6t)^2$

(calc copy error)

a) $\pi(70 + 6(.99))^2 = 18177.991519$

$\pi(70 + 6(1.01))^2 = 18174.501809$

$$\frac{18174.501809 - 18177.991519}{1.01 - .99}$$

$$\frac{-57.302652.69735}{.02} \quad \frac{}{.02} = \frac{-134.8675}{2865.1325} \text{ m/sec}^2$$

b) The derivitive of $x=1 = -134.8675$

3. $y = 30 - .14d$

a) $30 - .14(4.99) = 29.3014$

$30 - .14(5.01) = 29.2986$

$$\frac{29.2986 - 29.3014}{5.01 - 4.99}$$

$$\frac{-.0028}{.02}$$

$$= -.14 \text{ lbs/day}$$

The derivitive of $x=5 = -.14$ linear, same slope as problem

b. It is linear (They drink the same amount each day)

c) $30 - .14(6.99) = 29.0214$

$30 - .14(7.01) = 29.0186$

$\frac{29.0186 - 29.0214}{7.01 - 6.99}$

$\frac{-.0028}{.02}$

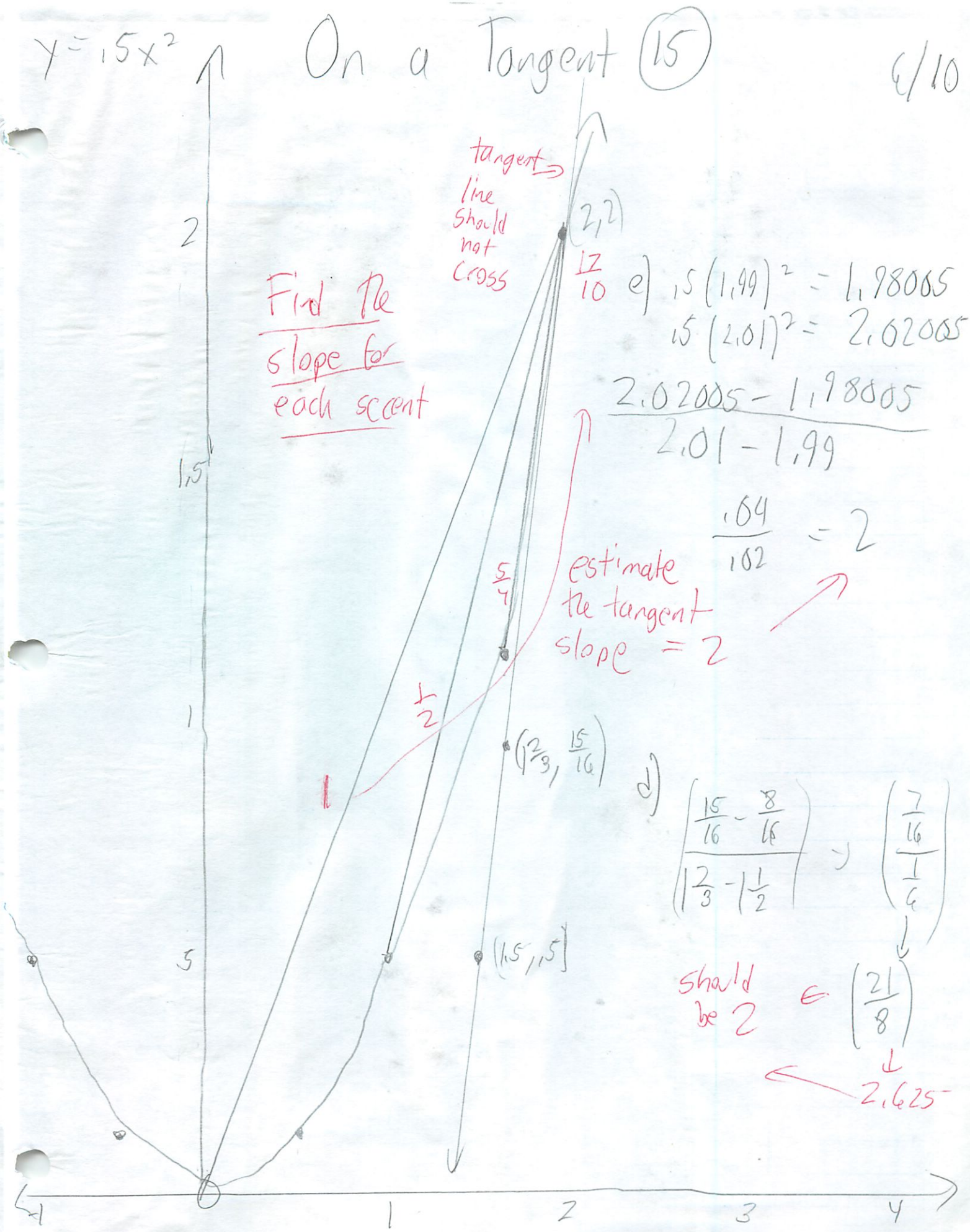
$-.14$

The derivitive of $x=7$ is $-.14$

$y = .5x^2$

On a Tangent (15)

6/10



e) $.5(1.99)^2 = 1.98005$

$.5(2.01)^2 = 2.02005$

$$\frac{2.02005 - 1.98005}{2.01 - 1.99}$$

$$\frac{.04}{.02} = 2$$

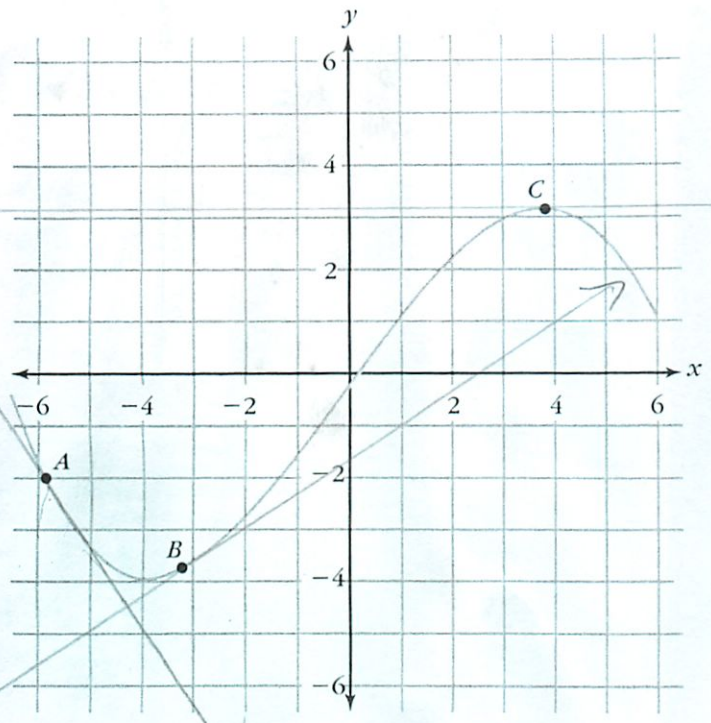
d) $\left(\frac{\frac{15}{16} - \frac{8}{16}}{1\frac{2}{3} - 1\frac{1}{2}}\right) \rightarrow \left(\frac{\frac{7}{16}}{\frac{1}{6}}\right)$

Should be 2 $\leftarrow \left(\frac{21}{8}\right)$

$\leftarrow 2.625$

HW 15 #2

2. The accompanying diagram shows the graph of a function.



a. Make a copy of this graph.

b. Draw the tangent lines to the graph at each of the points A, B, and C.

c. Use your work from Question 2b to estimate the derivative of the function at each of the points A, B, and C.

A) $(-4,-5)$ $(-5.8,-2)$

$\frac{-5--2}{-4--5.8} = \frac{-3}{1.8} \to -\frac{5}{3}$

B) $(1,-1)$ $(-5,-5)$

$\frac{-5--1}{-5-1} = \frac{-4}{-6} = \frac{2}{3}$

C) $(4,3)$ $(-2,3)$ $\frac{3-3}{4--2} = \frac{0}{6} = 0$

The derivative at any max or min = 0

Small World

Application of Instantaneous Speed

Name Michael Plasmeier

Date 6/11

The Derivative of a Fireworks Display

Using the following situation, answer the following questions with what you have learned about average speed and instantaneous speed. SHOW ALL WORK!!

A firework is launched off a platform 50 feet tall. The initial velocity of the firework is 90 ft./sec.

1. **Using the formula $h(t) = -16t^2 + vt + s$, graph this situation.**

2. **Make a table of values of this situation from t = 0 to t = time when the firework hits the ground.**

3. **Determine the average speed of the firework between 3 and 4 seconds.**

4. **What was the instantaneous rate of speed when the firework hit the ground?**

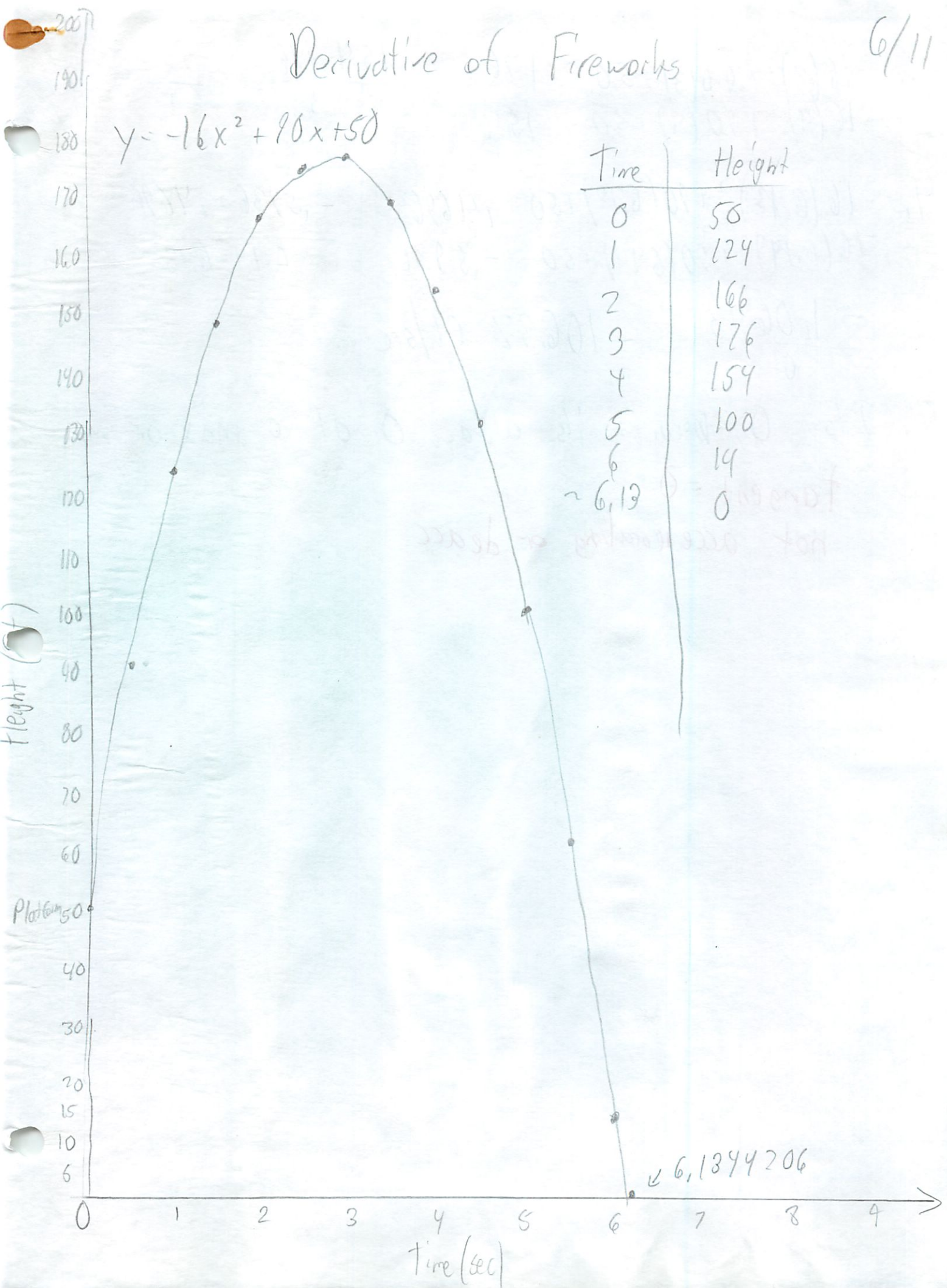
5. **What was the instantaneous rate of speed when the firework reaches its maximum height?**

Derivative of Fireworks

6/11

$y = -16x^2 + 80x + 50$

Time	Height
0	50
1	124
2	166
3	176
4	154
5	100
6	14
~6,13	0



3. $-16(3)^2+90(3)+50 = 176$
$-16(4)^2+90(4)+50 = 154$

$\frac{154-176}{4-3} = \frac{-22}{1} = -22$ ft/sec

4. $-16(6.13)^2+90(6.13)+50 = .4696$
$-16(6.14)^2+90(6.14)+50 = -.5936$

$\frac{-.5936-.4696}{6.14-6.13}$

$\frac{-1.0643}{.01} = -106.32$ ft/sec

5. Its 0, because its always 0 at a max or min

tangent = 0
not accelerating or deacc.

Name: Michael Plasreiter 22/20 Date: 5/21
IAG 4

IAG POWER I

Directions: Welcome to IAG POWER. There will always be 10 questions, and you must complete all questions **correctly**, **with work**. IAG POWER will always be worth **20 points**, with each question being worth **2 points**. Finally, there may be a final question worth double the points if you get it correct (but not a double loss of points if wrong). Good Luck!

Solve the following rational equations. Be sure to check for extraneous solutions.

1. $\frac{3x}{x+1} = \frac{12}{x^2-1} + 2$

$\frac{3x}{x+1} = \frac{12}{(x+1)(x-1)} + 2$

$\frac{3x(x-1)}{(x+1)(x-1)} = \frac{12}{(x+1)(x-1)} + \frac{2(x+1)(x-1)}{(x+1)(x-1)}$

$3x(x-1) = 12 + 2(x+1)(x-1)$

$3x^2 - 3x = 12 + (2x+2)(x-1)$

$3x^2 - 3x = 12 + 2x^2 - 2x + 2x - 2$

$-3x^2 + 3x$

$0 = -x^2 + 3x + 10$

factor

Answer: $x = -2, x = 5$ ✓ ✓

2. $\frac{-1}{x-3} = \frac{x-4}{x^2-27}$

$\frac{-1(x^2-27)}{(x-3)(x^2-27)} = \frac{(x-4)(x-3)}{(x^2-27)(x-3)}$

$-1(x^2-27) = (x-4)(x-3)$

$-x^2 + 27 = x^2 - 3x - 4x + 12$

$+x^2 \quad -27 \quad +x^2 \quad -27$

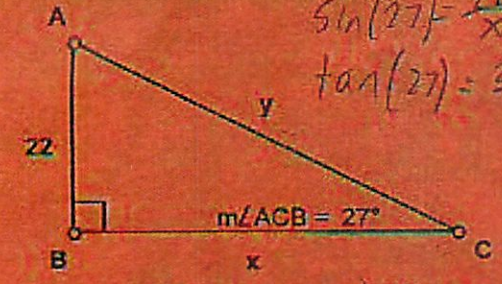
$0 = 2x^2 - 7x - 15$

factor

Answer: $x = 5, x = -1.5$ ✓ ✓

Find the missing sides in each of the triangles shown below.

3.

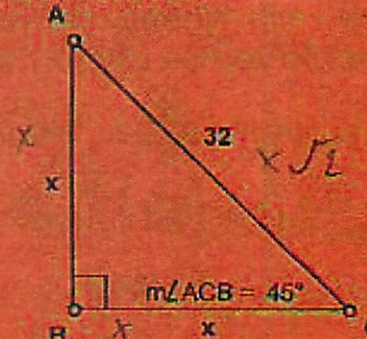


$\sin(27) = \frac{22}{x}$

$\tan(27) = \frac{22}{x}$

x = 43.17 y = 48.46

4.



$x\sqrt{2} = 32$

$\frac{x\sqrt{2}}{\sqrt{2}} = \frac{32}{\sqrt{2}}$

x = 22.63 or $(32/\sqrt{2})$

8

Study where no right angle

Factor each of the following polynomial expressions, **completely!**

5. $15x^2 + x - 28$

	$5x$	$+7$
$3x$	$15x^2$	$21x$
-4	$-20x$	-28

-420, $21 + (-20) = 1$

$5x+7=0$, $-7\ -7$, $\frac{5x}{5} = \frac{-7}{5}$

$3x-4=0$, $+4\ +4$, $\frac{3x}{3} = \frac{4}{3}$

Only these

Answer: $(5x+7)(3x-4)$ ✓

Check w/ reason or both or -should be 0

6. $5x^3 + 20x^2 - 60x$

$5x(x^2+4x-12)$

$5x(x-2)(x+6)$

$x-2=0$, $+7\ +7$, $x=2$

$x+6=0$, $-6\ -6$, $x=-6$

$\frac{5x}{5} = \frac{0}{5}$, $x=0$

Answer: $5x(x-2)(x+6)$

Can do nothing w/ it ✓

Simplify the following expressions, **completely!**

7. $\frac{2x^2-2}{4x} \cdot \frac{8x^2}{x^2+5x+4}$

Can do

$\frac{(2x-2)(x+1)}{4x} \cdot \frac{4x(2x)}{(x+4)(x+4)}$

$\frac{(2x-2)(2x)}{x+4}$

$\frac{4x^2-4x}{x+4}$

Answer: $\frac{4x^2-4x}{x+4}$

8. $\frac{5x}{x^2+6x-7} - \frac{2}{x-1}$

$\frac{5x}{(x-1)(x+7)} - \frac{2(x+7)}{(x-1)(x+7)}$ ✓

$\frac{5x-2x-14}{(x-1)(x+7)}$ ✓

$\frac{5x-2x-14}{(x-1)(x+7)}$

$\frac{3x-14}{(x-1)(x+7)}$

Answer: $\frac{3x-14}{(x-1)(x+7)}$

✓ Equiv

Complete each of the following. Show all work.

9. The Ferris Wheel at Trig Adventure has a radius of 40 feet, and its center is located 50 feet off of the ground. The Ferris Wheel turns at a constant speed, and it makes one complete cycle every 45 seconds. If you were riding the Ferris Wheel, and you started from the 3:00 position, how high in the air would you be after 2 minutes?

memories →

$40\left(\sin\left(\frac{360}{45} \cdot (0+2)\right)\right) + 50$

$40(\sin(960)) + 50$

$40(-.8660) + 50$

$-34.6410 + 50$

Answer: 15.36 ft

2 ✓ with Ferris ✓

20

Double-Points Problem. *Show all work, and answer question completely. If your answer is entirely correct, you will earn 4 points for this problem.*

10. Juan and José are expert house painters. Once, they each timed how long it took the other to paint a tool shed. Juan completed his shed in 3 hours, 20 minutes. José, on the other hand, took an extra 25 minutes to paint an identical shed. There is one more shed to paint today, identical to the other two they timed themselves on. They've decided to work together on this one. How long will it take if Juan and José work at the same rates that they painted earlier? [Express your answer in hours and minutes, with the minutes rounded to the nearest whole number.]

Juan: $3 \cdot 60 + 20 = 200$ min

José: $3 \cdot 60 + 20 + 25 = 225$ min

See Back for freaky math way

Total time for 2 sheds:

$200 + 225 = 425$ min

But for 1 shed:

212.5 min avg

And with 2 people:

106.25 min

$160 + 1$ hr $+ 46.25$ min

Answer: 1 hr, 46 min

Yes this makes sense. If they both do half, Juan will finish earlier. He will then help José complete his half. This would normally take 12.5 more minutes, but with is brother helping it takes just 6.25 min Actually a bit ~~less~~ more because Juan will wind up with more than half again of the smaller section. See back for math way

(2) (+2)

How long does this work?

$$\frac{1}{\frac{1}{\frac{225}{225}} + \frac{1}{\frac{200}{200}} + \frac{1}{\frac{180}{180}}}$$

$$\frac{1}{1 + 1 + \frac{11}{180}}$$

$$\frac{1}{\frac{391}{180}}$$

$$\frac{180}{391} \text{ hr} \times \frac{60 \text{ min}}{1 \text{ hr}} \approx 27.65 \text{ min}$$

How long does this work?

$$\frac{1}{\frac{1}{\frac{225}{45000}} + \frac{1}{\frac{200}{45000}} + \frac{1}{\frac{225}{45000}}}$$

$$\frac{1}{\frac{1}{5} + \frac{1}{4} + \frac{1}{5}}$$

$$\frac{1}{\frac{13}{20}}$$

$$\frac{20}{13} \text{ hr} \times \frac{60 \text{ min}}{1 \text{ hr}} \approx 92.31 \text{ min}$$

Name: Michael Plasencia 19/20 Date: 5/23
IAG 4

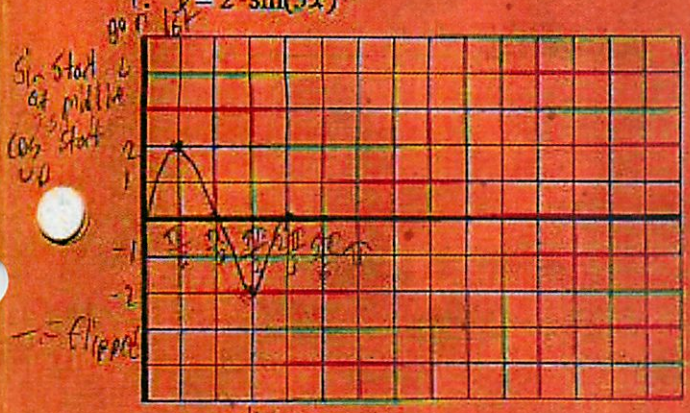
IAG POWER II

Directions: There are 10 questions, and you must complete all questions **correctly, with work.** IAG POWER is worth **20 points**, with each question being worth **2 points.** Good Luck.

Review

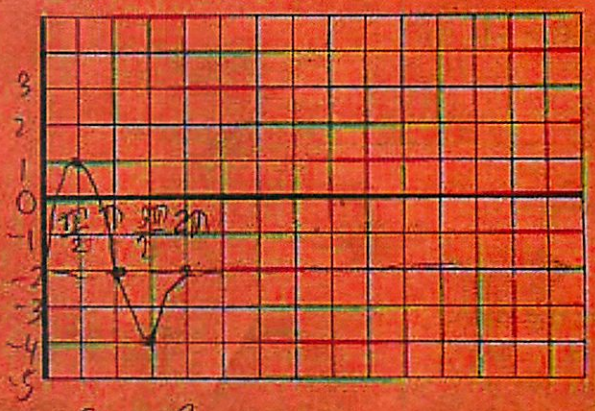
Graph each of the following functions on the graphs provided, between 0° and 360°. Use an appropriate scale. 1 cycle -show pts + pd + phase Δ

1. $y = 2 \cdot \sin(3x)$ amp 2 360/3



amplitude = 2
period = 120°
phase shift = 0
vert shift = 0

2. $y = 3 \cdot \sin(x) - 2$

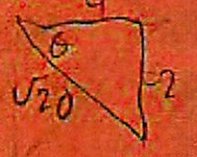


amp = 3
period = 360/1 = 360°
vert shift ↓ 2 phaseshift = 0

period / 4 = division

Find the value of $\sin\theta$ for each of the following if you are given a point which contains the terminal side of θ. Give the **exact** value. 1 ans - ratio

3. (4, -2)



$h^2 = 4^2 + 2^2$
$h = \sqrt{20}$

$\sin\theta = \frac{-2}{\sqrt{20}} \cdot \frac{\sqrt{20}}{\sqrt{20}} \quad \frac{-2\sqrt{20}}{20} \quad -\frac{\sqrt{20}}{10} \quad -\frac{2\sqrt{5}}{10}$

Answer: $\frac{-\sqrt{5}}{5}$

4. (2, 6)

$h^2 = 2^2 + 6^2$
$h\sqrt{40}$

$\sin\theta = \frac{6}{\sqrt{40}} \cdot \frac{\sqrt{40}}{\sqrt{40}} = \frac{6\sqrt{40}}{40} \quad \frac{3\sqrt{40}}{20} \quad \frac{6\sqrt{10}}{20}$ Reduce!

Answer: $\frac{3\sqrt{10}}{10}$

8

5. (-1, -5) $h^2 = (-1)^2 + (-5)^2$ Answer: $\frac{-5\sqrt{26}}{26}$

$h = \sqrt{26}$ $\sin\theta = \frac{-5}{\sqrt{26}}$ $\frac{\sqrt{26}}{\sqrt{26}}$ $\frac{-5\sqrt{26}}{26}$

Find the value(s) of θ between 0° and 360° given the value of sin θ.

6. $\sin\theta = -\frac{\sqrt{3}}{2}$ $\theta + \ominus$ where?

$\sin^{-1}$ $\sin^{-1}$

$\theta = -60°$

⊖ 3rd: 240° $\frac{4\pi}{3}$

⊖ 4th: 300°, $\frac{5\pi}{3}$

Answer: ⊖ 3rd: 240° $\frac{4\pi}{3}$, ⊖ 4th: 300° $\frac{5\pi}{3}$

7. $\sin\theta = -1$ Answer: 270° $\frac{3\pi}{2}$

$\sin^{-1}$ $\sin$

$\theta = -90$

⊖ 3rd:

⊖ 4th

8. $\sin\theta = 0.432$ ⊕ 1st: 25.59° or .0445r

$\sin^{-1}$ $\sin$ Answer: ⊕ 1st: 25.59° or .0445r, ⊕ 2nd: 154.405° or 2.730r

$\theta = 25.59°$ ⊕ 2nd: 154.405° or 2.730r ← radians = $\frac{\text{deg}}{180}\cdot\pi$

Complete the following. Show all work!

9. Simplify completely: $\frac{4x}{x^2-4x-21} - \frac{2}{3x+9} - 3$

$\frac{4x}{(x-7)(x+3)} - \frac{2}{3(x+3)} - \frac{3}{1}$

$\frac{4x(3)}{3(x-7)(x+3)} - \frac{2(x-7)}{3(x+3)(x-7)} - \frac{3(3)(x+3)(x-7)}{3(x+3)(x-7)}$

$\frac{12x - 2x + 14 - [9(x^2 - 7x + 3x - 21)]}{3(x-7)(x+3)}$

$\frac{10x + 14 - 9x^2 + 36x + 189}{3(x-7)(x+3)}$

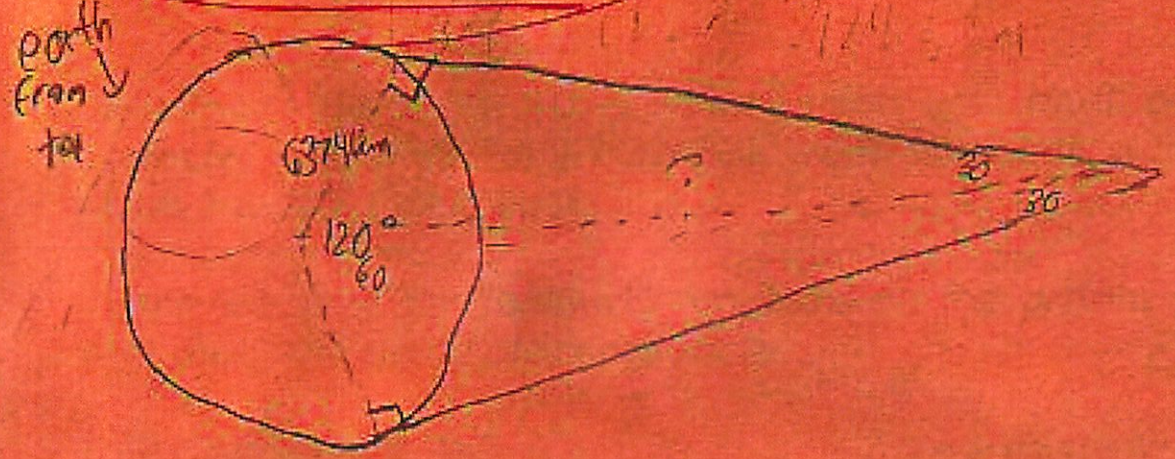
$\frac{-9x^2 + 46x + 203}{3(x-7)(x+3)}$

2 eqns

Answer: $\frac{-9x^2 + 46x + 203}{3(x-7)(x+3)}$

10

10. **Double-Points:** The radius of the earth (at the equator) is 6374 km. If you wanted to go out into space and take a picture of the earth, how far from the earth (above the equator) would you have to go to make sure that you got 1/3 of the equator in your picture? **HINT:** Remember that a line tangent to a circle forms a right angle with the radius of the circle. **EXPLAIN YOUR PROCESS.**



$\cos(60) = \frac{6374}{x}$

dorm

$\frac{.5x}{.5} = \frac{6374}{.5}$

$x = 12748$ - 6,374 km = earth's radius

Answer: 6374 km

-1

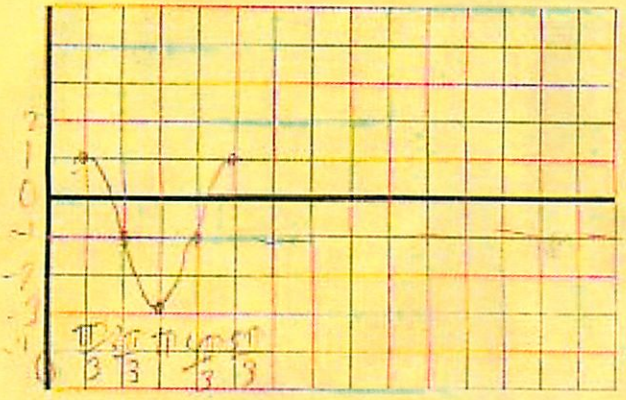
Name: Michael Macmeier Date: 5/30
IAG 4

IAG POWER III

Directions: There are 10 questions, and you must complete all questions **correctly, with work.** IAG POWER is worth **20 points**, with each question being worth **2 points.** Good Luck.

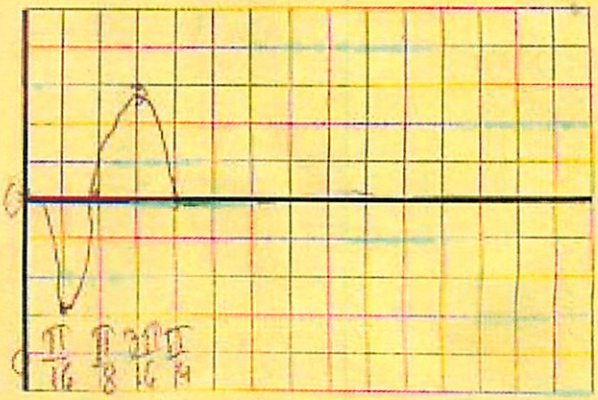
Graph the following trig functions. Graph only ONE PERIOD, and indicate your scale.

1. $y = 2 \cdot \cos(3x - \pi) - 1$



amp = 2
Pd = 120° $\frac{360}{|3|}$
Phase shift $\frac{\pi}{3} \rightarrow$
vert shift = -1
interval = $\frac{\pi}{3}$

2. $y = -3 \cdot \sin\left(4x + \frac{\pi}{2}\right)$



amp = 3
pd = 90° $\frac{360}{4}$
phase = $\frac{\pi}{8} \leftarrow \frac{\pi}{6}$
vert = 0
$\frac{\pi}{16}$ interval

Solve the following trig equations below, for $0 \le x < 2\pi$.

3. $4 \cdot \cos^2 x - 1 = 0$ Answer:

solve

multiple ans - identities

$\frac{4\cos^2 x}{4} = \frac{1}{4}$

$\cos^2 x = \frac{1}{4}$

$\cos x = \pm\sqrt{\frac{1}{4}}$

$\cos^{-1}$ $\cos^{-1}$

$x = 60$ -60

(+) 1st : 60° : $\frac{\pi}{3}$
(+) 4th : 300° : $\frac{5\pi}{3}$
(−) 2nd : 120° $\frac{2\pi}{3}$
(−) 3rd : 240° $\frac{4\pi}{3}$

Sum + diff formula

4. $\tan\left(x+\frac{\pi}{4}\right)+\tan x+2=0$

Answer: _____

Solve the following rational equations.

5. $\frac{x}{x-1}=\frac{2x+10}{x+11}$

Answer: _____

6. $\frac{x}{x+2}-2=\frac{-9}{2x-3}$

Answer: _____

Complete the following. *Show all necessary work.*

7. Find a negative and positive coterminal angle for $\theta=\frac{7\pi}{5}$.

Answer: _____

8. Evaluate the value of $\arctan\left(-\sqrt{3}\right)$.

Answer: _____

$\frac{1}{\sin}$

9. Find the exact value of $\csc\theta$ if θ has a terminal side at (-9, -4).

$\sqrt{h} = 4^2 + 9^2$

$\frac{r}{y} = \frac{\sqrt{97}}{-4}$ Answer: $-\frac{\sqrt{97}}{4}$

10. Prove the following identities:

(a) $\csc^2 x - \cos^2 x \csc^2 x = 1$

$\csc^2 x - \cos^2 x \cdot \frac{1}{\sin^2 x}$

$\csc^2 x - \frac{\cos^2 x}{\sin^2 x}$

$\csc^2 x - \cot^2 x$

$1 = 1$

(b) $\frac{1-\cos^2 x}{\tan x} = \sin x \cos x$

$\frac{\sin^2 x}{\tan x}$

$\frac{\sin x^2}{\frac{\sin x}{\cos x}}$

$\frac{\sin x^2}{1} \cdot \frac{\cos x}{\sin}$

$\frac{\sin x^2 \cos x}{\sin x}$

$\sin x \cos x = \sin x \cos x$

6/4

Name: Michael Plasmeier Date: 6/4

IAG 4

IAG POWER IV

Directions: There are 10 questions, and you must complete all questions **correctly, with work.** Good Luck.

Find the equations of the vertical asymptotes for the functions below.

1. $f(x)=\frac{3x}{2x-9}$ Answer: $x=4.5$

$2x-9=0$

$+9 \quad +9$

$\frac{2x}{2}=\frac{9}{2}$ $x=$

(1)

2. $f(x)=\frac{-2x+3}{3x^2-10x+3}$ Answer: $x=\frac{1}{3}, 3$

$3x^2-10x+3$

$9 \cdot 1 = 9x$, $-1 \cdot -10 = 10x$, $-9x - 1x = -10x$

	$3x$	-1
x	$3x^2$	$-x$
3	$-9x$	3

$(3x-1)(x-3)$

$3x-1=0$ $\quad x-3=0$

$+1 \quad +1$ $\quad +3 \quad +3$

$\frac{3x}{3}=\frac{1}{3}$ $\quad x=3$

(2)

Solve the following trig equations for $0 \le \theta \le 2\pi$.

Std

3. $\sin^2 x+2\cdot\sin x+1=0$ Answer: $270°, \frac{3\pi}{2}$

$(x+1)(x+1)$

$(\sin x+1)^2=0$

$\sqrt{\sin x+1}=\sqrt{0} \rightarrow \sin x=-1$

$\sin^{-1} \quad \sin^{-1}$

$x=270°$

4. $4\cdot\cos 2x-4\cdot\cos^2 x=3$ Answer: non-real ans

$-4\cos^2 x+4\cos^2 x-4\sin^2 x=3$

$-4\sin^2 x=3$

$\frac{-4\sin^2 x}{-4}=\frac{3}{-4}$

$\sin^2 x=-\frac{3}{4}$

$\sin x=\pm\sqrt{-\frac{3}{4}}$

$\sin^{-1} \quad \sin^{-1}$

Complete the following. Show all of your work.

5. Find the area of a triangle that has sides 14, 15, and 24.

Law Cosigns

$\cos A=\frac{24^2+14^2-15^2}{2(24)(14)}$

$\cos A=.8196$

$\cos^{-1} \quad \cos^{-1}$

$A=35.5127$

$A=\frac{1}{2}(24)(14)\sin(35.5127)$

Answer: 97.5851

just factor

6. Factor the polynomial completely: $3x^3 + x^2 - 12x - 4$.

$x^2(3x+1) - 4(3x+1)$

$(x^2-4)(3x+1)$

$(x+2)(x-2)(3x+1)$

Answer: $(x+2)(x-2)(3x+1)$

7. Identify the family of functions to which the table below belongs.

2	48
4	12
6	3
8	0.75

$\div 2$, $\div 2$, $\div 2$, $\div 2$

Answer: exponential decay

8. Find the domain and range of the function $g(x) = -2\sqrt{4x-5}$.

$\sqrt{0} = 0$

$4x - 5 = 0$

$+5 \quad +5$

$\frac{4x}{4} = \frac{5}{4}$

$x = \frac{5}{4}$

don't need to

g less than (or) equal

Domain: $x \leq 1.25$

Range: $y \leq 0$

9. Find the values of θ in which $\cot\theta = -\frac{\sqrt{3}}{3}$, where $-2\pi \leq \theta \leq 2\pi$

$\cot\theta = \frac{1}{\sqrt{3}}$ ← base

$\tan\theta = \sqrt{3}$

$\tan^{-1} \quad \tan^{-1}$

$x = -60, \quad 120, \quad 300,$

$-60, \quad -240,$

$-\frac{\pi}{3}, \quad -\frac{4\pi}{3}, \quad \frac{2\pi}{3}, \quad \frac{5\pi}{3}$

Answer:

10. Find the domain and range of $h(x) = \frac{x^2-3}{x^2-4}$.

$x^2 - 4 = 0$

$+4 \quad +4$

$\sqrt{x^2} = \sqrt{4}$

$x = \pm 2$

Domain: $\mathbb{R} \neq 2, -2$

Range: