

a. Inverse

b. yes, $y = x$

+3

*2

$y^{-1} = 2(x+3)$ or

$y^{-1} = 2x + 6$

9. $A(x) = 3^x$

a. $A(2) = 3^2 = 9$

b. $3^x = 81$

means $x = 4$

$4/81$

c. $3^x = 8$

between 1 & 2

1.89	7.9755	← This is closer to 8, so $x = 1.89$
1.90	8.0636	

10. $\sin x = .75$

Type $\sin^{-1}(.75)$ into the calc. to find the angle

so, $x = 48.59^\circ$

check: $\sin(48.59) = .75 \checkmark$

11. x must equal y

let $x=2$, $10^2 = 100$

so, $10^y = 100$ means $y=2$ also

12. a. $\frac{x}{3} = \frac{4}{5}$

$5x = 12$

$x = \frac{12}{5}$

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

$7x = 5(x+1)$

$7x = 5x + 5$

$2x = 5$

$x = \frac{5}{2}$

c. $\frac{15(6)}{15} = (2 - \frac{x}{5}) \cdot 15$

$6 = 30 - 3x$

$-24 = -3x$

$x = 8$

→

12. d. $15 \left(\frac{2}{3} + \frac{x}{5} \right) = 15$

$$10 + 3x = 90$$

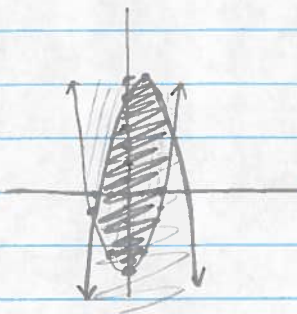
$$3x = 80$$

$$x = \frac{80}{3}$$

13. $y \geq x^2 - 5$ - Parabola, $v(0, -5)$, up

$$y \leq -(x-1)^2 + 7$$

Parabola, $v(1, 7)$ down



14. $x = \text{weight (oz)}$

$$y = \text{cost (\$)}$$

Co. $(5, 44)$ and $(12, 112)$

$$m = \frac{44 - 112}{5 - 12} = \frac{-68}{-7}$$

$$= 9.71$$

$$y = mx + b$$

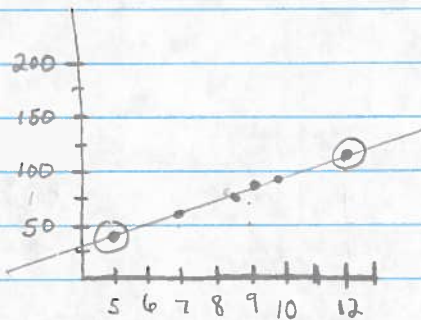
$$44 = 9.71(5) + b$$

$$44 = 48.57 + b$$

$$b = -4.57$$

d. $y = 9.71(50) - 4.57$

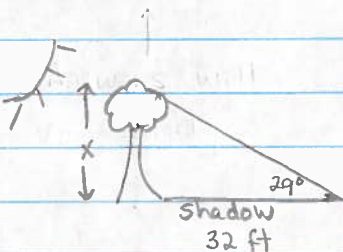
$$y \approx \$480.93$$



$$y = 9.71x - 4.57$$

Answers will vary slightly

15.



$$\tan 29 = \frac{x}{32}$$

$$x = 32 \tan 29$$

$$x = 17.74 \text{ feet}$$

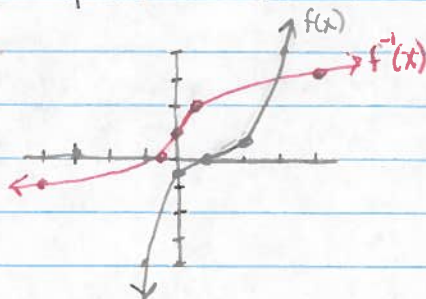
Lesson 5.1.2 (day 1) p. 219-220: 26-32

26. $f(x) = \frac{1}{2}(x-1)^3$

0	-5
1	0
2	1.5
3	4
-1	-4

-5	0
0	1
1.5	2
4	3
-4	-1

Inverse



27. a. $y = 3x - 8$

$\times 3 \downarrow \uparrow \div 3$
 $-8 \downarrow \uparrow + 8$

Inverse: $y = \frac{x+8}{3}$

b. $y = \frac{1}{2}x + 6$

$\div 2 \downarrow \uparrow \times 2$
 $+6 \downarrow \uparrow -6$

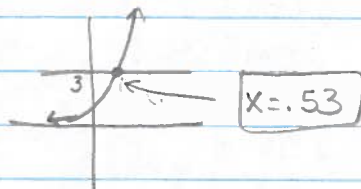
Inverse: $y = 2(x-6)$

c. $y = \frac{x+6}{2}$

$+6 \downarrow \uparrow -6$
 $\div 2 \downarrow \uparrow \times 2$

Inverse: $y = 2x - 6$

28. $3 = 8^x$ Graph it! $y_1 = 8^x$
 $y_2 = 3$



or use a table

29. a. $(x+2)(x-7)$

2	$(2x)$	-14	$x^2 - 5x - 14$
x	x^2	$(-7x)$	
	x	-7	

b. $(3m+7)(2m-1)$

7	$(14m)$	-7	$= 6m^2 + 11m - 7$
3m	$(6m^2)$	$(3m)$	
	2m	-1	

c. $(x-3)^2$

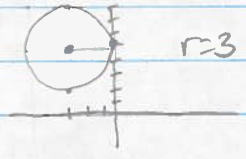
-3	$(3x)$	9	$x^2 - 6x + 9$
x	x^2	$(-3x)$	
	x	-3	

d. $(2y+3)(2y-3)$

3	$(6y)$	9	$4y^2 - 9$
2y	$(4y^2)$	$(-6y)$	
	2y	-3	

30. c (-3, 5), tan to y-axis

$$(x+3)^2 + (y-5)^2 = 9$$



31. a. $\frac{(x+2)(x-3)}{(x+1)(x-4)} \cdot \frac{(x+1)}{x(x+2)}$
 $= \frac{x-3}{x(x-4)}$

b. $\frac{x^2+5x+6}{x^2-4} \cdot \frac{4}{x+3} = \frac{(x+3)(x+2)}{(x+2)(x-2)} \cdot \frac{4}{x+3}$

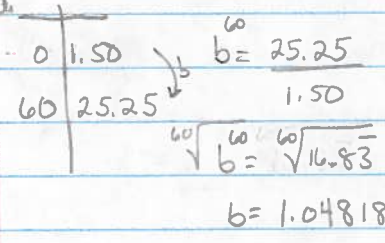
3	3x	6
x	x ²	2x
	x	2

 $\frac{6x^2}{3x \cdot 2x} = \frac{5x}{5x}$
 $= \frac{4}{x-2}$

c. $\frac{2x}{x+4} + \frac{8}{x+4} = \frac{2x+8}{x+4} = \frac{2(x+4)}{x+4} = 2$

d. $\frac{x}{x+1} - \frac{1}{x+1} = \frac{x-1}{x+1}$

32 a.



b. let $x=120$

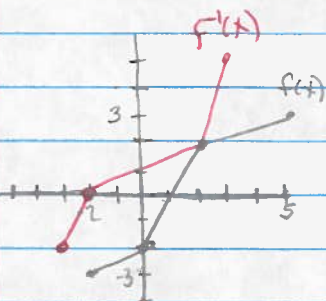
$$y = 1.50 (1.048)^{120}$$

$y = \$416.34$ if you used this rounded number

$y = \$425.04$ if you used this non-rounded number

$$y = 1.50 (1.048)^x$$

33.

Domain of $f(x)$: $-2 \leq x \leq 5$ Range of $f(x)$: $-3 \leq y \leq 3$ Domain of $f^{-1}(x)$: $-3 \leq x \leq 3$ Range of $f^{-1}(x)$: $-2 \leq y \leq 5$

34. a. $L(x) = x^2 - 1$ b. $L(3) = 3^2 - 1 = 9 - 1 = 8$

$R(x) = 3(x+2)$

$R(8) = 3(8+2) = 3(10) = \boxed{30}$

c. $R(3) = 3(3+2) = 3(5) = 15$

$L(15) = 15^2 - 1 = 225 - 1 = \boxed{224}$

yes, the order matters b/c we don't get the same answer.

35. $x - 2y = 7 \rightarrow x = \boxed{2y+7}$

$6y - 3x = 33$

$6y - 3(2y+7) = 33$

$6y - 6y - 21 = 33$

$-21 = 33$

a. Both variables drop and I get a False answer, which means there is no solution

b. The graphs are parallel lines.

36. 3.25% per year compounded 4x per year means

the rate is $\frac{3.25}{4} = .8125\% = .008125$

$y = 412.54(1.008125)^8 = \boxed{\$440.13}$

37. a. $(x+4)(x-14)$

4	$(+x)$	-56
x	x^2	$(-14x)$
	x	-14

$x^2 - 10x - 56$

b. $(2m+5)(2m-1)$

5	$(10m)$	-5
2m	$4m^2$	$(-2m)$
	2m	-1

$4m^2 + 8m - 5$

c. $(x-9)(x+9)$

9	$(9x)$	-81
x	x^2	$(9x)$
	x	9

$x^2 - 81$

d. $(3y+2)^2$

2	$(6y)$	4
3y	$9y^2$	$(6y)$
	3y	2

$9y^2 + 12y + 4$

38. a. $y = (x-2)(x+1)$
 $\downarrow \quad \downarrow$
 $x=2 \quad x=-1$

x-int: $(2, 0), (-1, 0)$

b. $y = 2x^2 + 16x + 30$

$y = 2(x^2 + 8x + 15) = 2(x+5)(x+3)$
 $\downarrow \quad \downarrow$
 $x=-5 \quad x=-3$

5	$5x$	15
x	x^2	$3x$
	x	3

~~$15x^2$
 $5x^2$
 $3x$
 $8x$~~

x-int: $(-5, 0), (-3, 0)$

39. If $2^{x+4} = 2^{3x-1}$, find x.

$x+4 = 3x-1$

$5 = 2x$

$x = \frac{5}{2}$

48. $f(x) = 5x - 3$
 $g(x) = (x-1)^2$

a. $f(3) = 5(3) - 3 = 12$

$g(12) = (12-1)^2 = 11^2 = 121$

b. $g(3) = (3-1)^2 = 2^2 = 4$

$f(4) = 5(4) - 3 = 17$

These answers are not equal b/c the eqns are not inverses!

49. a. $(x+1)(2x^2-3)$

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

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

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

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

1	x^2	-2x	3
x	x^3	-2x^2	3x
	x^2	-2x	3

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

3	$3x$	9
x	x^2	3x
	x	3

$= 2(x^2 + 6x + 9)$

$2x^2 + 12x + 18$

d. $(x+1)(2x-3)^2 = (x+1)(4x^2-12x+9)$

3	-6x	9
2x	$4x^2$	-6x
	2x	-3

$4x^2 - 12x + 9$

1	$4x^2$	-12x	9
x	$4x^3$	-12x^2	9x
	$4x^2$	-12x	9

$4x^3 - 8x^2 - 3x + 9$

50. a. $\frac{3x}{5} \cdot \frac{x-2}{4}$

$5x - 10 = 12x$

$-10 = 7x$

$x = -\frac{10}{7}$

b. $\frac{4x-1}{x} \cdot \frac{3x}{1}$

$3x^2 = 4x - 1$

$3x^2 - 4x + 1 = 0$

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

$3x^2 - 4x + 1 = 0$

$(x-1)(3x-1) = 0$

$x = 1, x = \frac{1}{3}$

c. $\left(\frac{2x}{5}\right)^5 - \left(\frac{1}{3}\right)^5 = \left(\frac{137}{3}\right)^5$

$6x - 5 = 685$

$6x = 690$

$x = 115$

50. d. $\frac{4x-1}{x+1} = x-1$
 $(x+1)(x-1) = 4x-1$
 $x^2-1 = 4x-1$
 $x^2-4x = 0$
 $x(x-4) = 0$
 $x=0 \quad x=4$

51a. $y = x^2 + 3$
 $x = y^2 + 3$
 $\sqrt{y^2} = \sqrt{x-3}$
 $y = \pm \sqrt{x-3}$

51b. $y = (\frac{1}{4}x + 6)^3$
 $\sqrt[3]{x} = \sqrt[3]{(\frac{1}{4}y + 6)^3}$
 $\sqrt[3]{x} = \frac{1}{4}y + 6$
 $\frac{1}{4}y = \sqrt[3]{x} - 6$
 $y = 4(\sqrt[3]{x} - 6)$

51. a. $y = \sqrt{5x-6}$
 $x = (\sqrt{5y-6})^2$
 $x^2 = 5y-6$
 $5y = x^2 + 6$
 $y = \frac{x^2 + 6}{5}$

52. $x^2 + y^2 - 4x - 16 = 0$
 $x^2 - 4x + y^2 = 16$
 $(x-2)^2 + y^2 = 20$
 Circle, $r = \sqrt{20} \approx 4.5$
 $C(2, 0)$



53. $\frac{100}{20} = \frac{350}{x}$ $100x = 7000$
 $x = 70$ maggots

54. a. $\frac{x^2 + 4x + 3}{x^2 + 3x} \cdot \frac{3x}{x+1} = \frac{(x+3)(x+1)}{x(x+3)} \cdot \frac{3x}{x+1} = 3$

3	3x	3
x	x^2	1x

~~3x^2~~
~~4x~~

b. $\frac{y^2}{y+4} - \frac{16}{y+4} = \frac{y^2-16}{y+4} = \frac{(y+4)(y-4)}{y+4} = y-4$

$$54. c. \frac{x^2+x}{x^2-4x-5} \div \frac{3x^2}{x-5} = \frac{x(x+1)}{(x-5)(x+1)} \cdot \frac{x-5}{3x^2} = \boxed{\frac{1}{3x}}$$

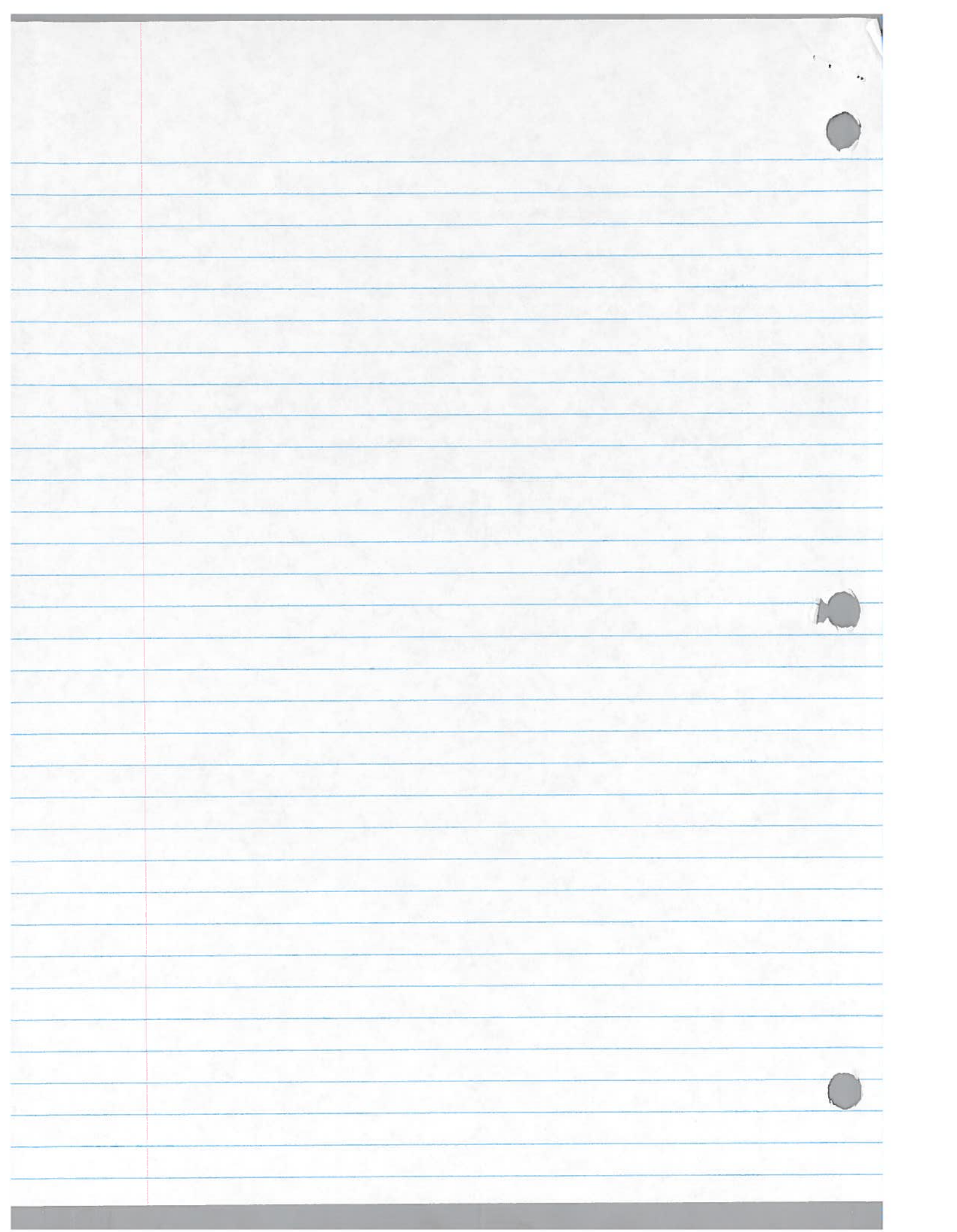
-5	-5x	-5
x	x ²	x
x		1

$\begin{array}{c} -5x^2 \\ \times \\ -4x \end{array}$

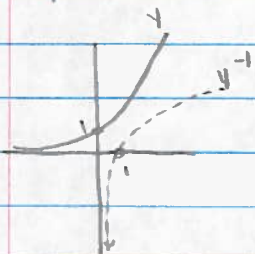
$$54. d. \frac{x^2-6x}{x^2-4x+4} + \frac{4x}{x^2-4x+4} = \frac{x^2-2x}{x^2-4x+4} = \frac{x(x-2)}{(x-2)(x-2)} = \boxed{\frac{x}{x-2}}$$

-2	-2x	4
x	x ²	-2x
x		-2

$\begin{array}{c} 4x^2 \\ \times \\ -4x \end{array}$



60. $y = 3^x$



D: $x > 0$

R: \mathbb{R}

x-int: $(1, 0)$

y-int: None

Asymptote: $x = 0$ (y-axis)

61. $f(x) = \frac{2}{7-x}$

a. $f(7) = \frac{2}{7-7} = \frac{2}{0} = \text{undefined}$

b. D: $x \neq 7$

c. $g(x) = 2x + 5$, then $g(3) = 2(3) + 5 = 11$

d. $f(11) = \frac{2}{7-11} = \frac{2}{-4} = -\frac{1}{2}$

62. $f(x) = 1 + \sqrt{x+5}$

a. $y = 1 + \sqrt{x+5}$

$x = 1 + \sqrt{y+5}$

$(x-1)^2 = (\sqrt{y+5})^2$

$(x-1)^2 = y+5$

$y = (x-1)^2 - 5$

$e(x) = (x-1)^2 - 5$

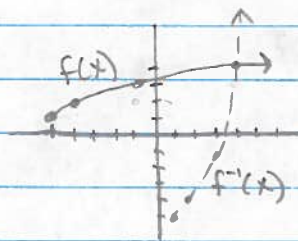
b. one machine will undo the other

b/c they are inverses of each other

so, $e(f(-4)) = -4$

c. They would reflect across $y=x$ onto each other

d.

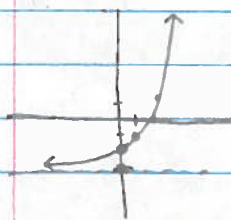


-5	1
-4	2
-1	3
4	4

1	-5
2	-4
3	-1
4	4

63. $y+3 = 2^x$

$y = 2^x - 3$



a. D: \mathbb{R}
R: $y > -3$

b. NO line of symm

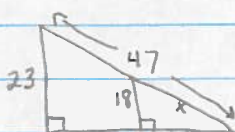
c. x-int: $(1.58, 0)$
y-int: $(0, -2)$

d. slide the graph up at least 3 units, so

$y = 2^x$ or

$y = 2^x + (\text{any } \# \geq 0)$

64. a.

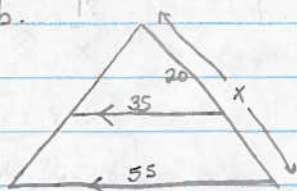


$$\frac{23}{47} \times \frac{18}{x}$$

$$23x = 846$$

$$x = 36.78$$

b.



$$\frac{55}{x} \times \frac{35}{20}$$

$$35x = 1100$$

$$x = 31.43$$

65. bonds: 7% interest

stocks: 9% interest

a. $B = .07(.30x)$ or $B = .021x$

b. $S = .09(.70x)$ or $S = .063x$

c. $.021x + .063x = 5000$

$$.084x = 5000$$

$$x = 59,523.81$$

66. a. $x^2 - 49$

$$(x+7)(x-7)$$

b. $6x^2 + 48x$

$$6x(x+8)$$

c. $x^2 - x - 72$

-9	-9x	-72
x	x ²	8x
	x	8

$$\frac{-72+2}{-9x} \times \frac{8x}{-1}$$

$$(x-9)(x+8)$$

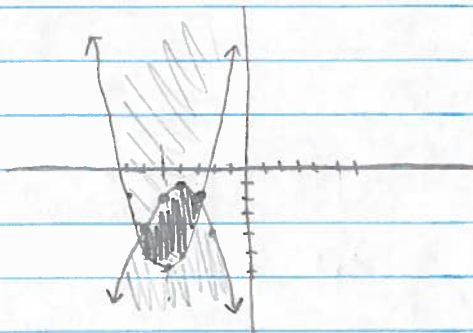
d. $2x^3 - 8x$

$$2x(x^2 - 4)$$

$$2x(x+2)(x-2)$$

67. $y \geq (x+5)^2 - 6$ $v(-5, -6)$

$y \leq -(x+4)^2 - 1$ $v(-4, -1)$



73. $y = \log_2 X \Rightarrow X = 2^y$

x	y
0	undef.
1	0
2	1
3	1.585
4	2

x	y
1	0
4	2

- No, they don't look the same
 - Yes, they mean the same thing
 - Yes, they are equivalent b/c one is a rewritten eq'n of the other base on how we convert from log \rightarrow Exp.
- Also, table values are the same.

74. $4^3 = 64$ is equivalent to $3 = \log_4 64$

Exp. Form

Log. Form

- | | | |
|----|-----------------------|-----------------------------|
| a. | $y = 5^x$ | $x = \log_5 y$ |
| b. | $x = 7^y$ | $y = \log_7 x$ |
| c. | $8^x = y$ | $x = \log_8 y$ |
| d. | $A^k = c$ | $k = \log_A c$ |
| e. | $A^k = c$ | $k = \log_A c$ |
| f. | $k = (\frac{1}{2})^n$ | $\log_{\frac{1}{2}}(k) = n$ |

75.

Pound	\$
$\frac{1}{2}$.95
1	1.38
2	1.92
5	4.70
10	9.04
20	17.52

a. $\frac{.5}{.95} \times \frac{1}{x} \quad .5x = .95 \quad x = \$1.90 / lb$

b. $\$1.38 / lb$

c. $\frac{2}{1.92} \times \frac{1}{x} \quad 2x = 1.92 \quad x = \$.96 / lb$

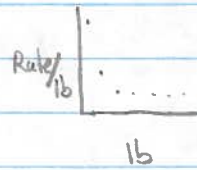
d. $\frac{5}{4.70} \times \frac{1}{x} \quad 5x = 4.70 \quad x = \$.94 / lb$

e. $\frac{10}{9.04} = \frac{1}{x} \quad 10x = 9.04 \quad x = \$.90 / lb$

f. $\frac{20}{17.52} = \frac{1}{x} \quad 20x = 17.52 \quad x = \$.88 / lb$

b. Unit price decreases when bag size increases.

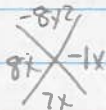
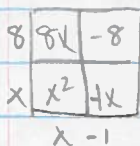
c. unit rate change is more drastic with smaller bags.



76. a. $x^2 + 7x - 8 = 0$ Factor

76. b. $(x+2)^2 = 4$

sq. \sqrt both sides
& undo.



76. c. $5x^2 - x - 7 = 0$

Quad. Formula

$(x+8)(x-1) = 0$

$-8, 1$

76. d. $x^2 + 4x = -1$

$x^2 + 4x + 1 = 0$

Quad Formula

77. $\frac{3x}{10} = \frac{(x-8)}{10} \Rightarrow 3x = x - 8$

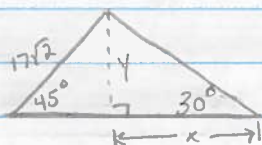
$\frac{3 \cdot 4}{10} = \frac{-4 - 8}{10}$

$2x = -8$

$10^{-12} = 10^{-12} \checkmark$

$x = -4$

78. a



$\sin 45^\circ = \frac{y}{17\sqrt{2}}$

$\tan 30^\circ = \frac{17}{x}$

$y = 17\sqrt{2} \sin 45^\circ$

$x = \frac{17}{\tan 30^\circ}$

$y = 17$

$x = 29.44$

b.



$\frac{\sin 30^\circ}{x} = \frac{\sin 45^\circ}{8}$

law of Sines

$x \sin 45^\circ = 8 \sin 30^\circ$

$x = \frac{8 \sin 30^\circ}{\sin 45^\circ}$

$x = 5.66$

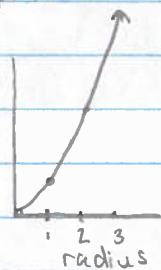
79. input = radii = x

output = area = y

$A = \pi r^2$

$y = \pi x^2$

Area



- $\frac{1}{2}$ Parabola opening up - y-int: (0,0)

- D: $x \geq 0$

- NO Asymptotes

- R: $y \geq 0$

- x-int: (0,0)

80. $y = (x+6)^2 - 7$

a. $V(-6, -7)$ opens up w/ no vertical stretch or compression

b. I would Add 9 to the eqn ... or shift the graph up 9 units.

c. I would make a t -table, then plot pts. All points should be above the x -axis.

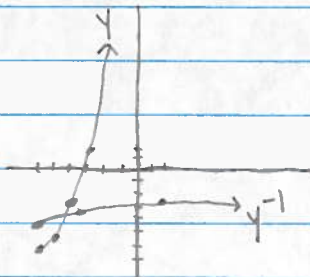
d. $y = (x+6)^2 - 7$

$$x = (y+6)^2 - 7$$

$$\sqrt{x+7} = \sqrt{(y+6)^2}$$

$$y+6 = \pm \sqrt{x+7}$$

$$y^{-1} = \pm \sqrt{x+7} - 6$$



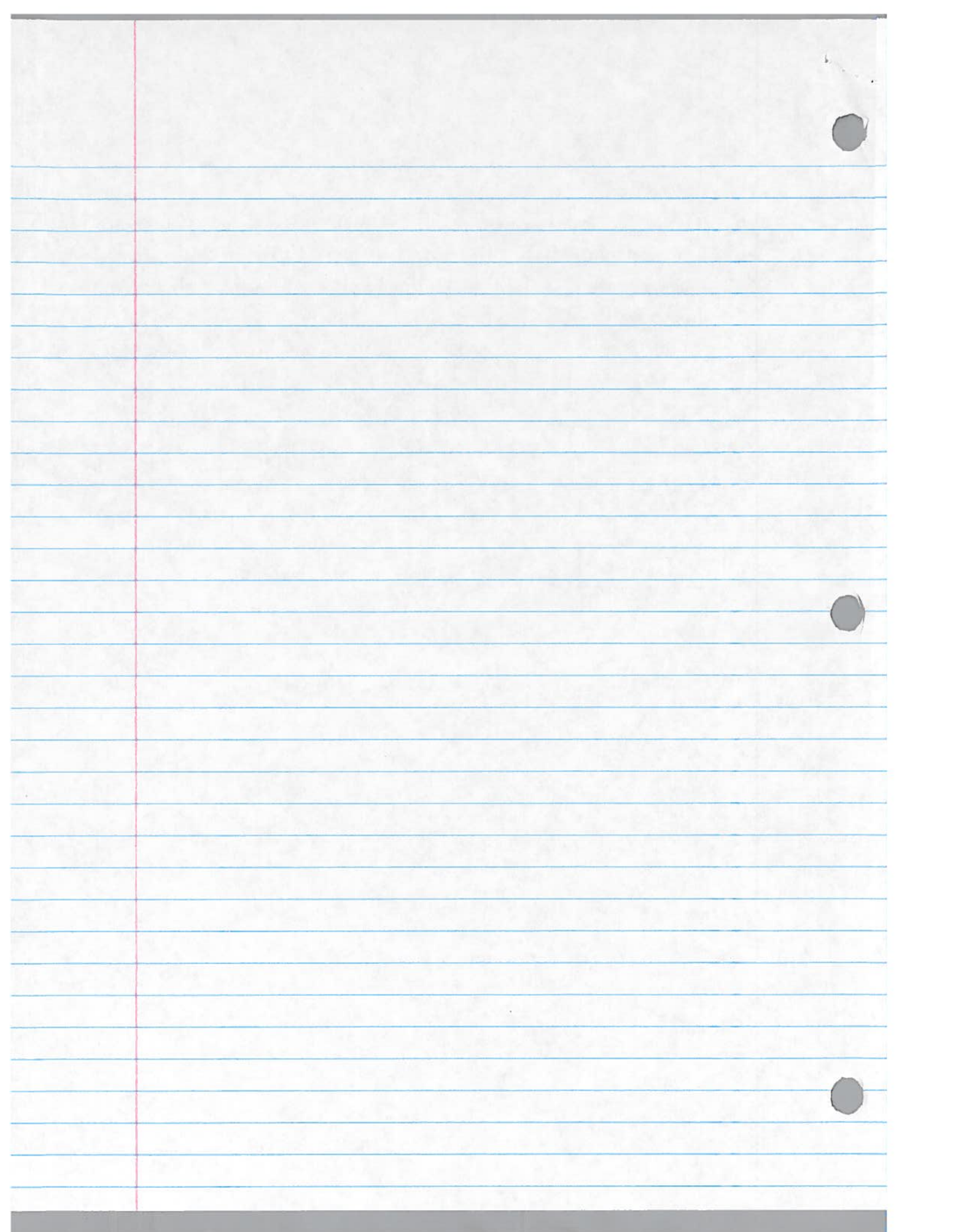
original

Inverse

-6	-7
-5	-6
-4	-3
-3	2
-2	9
-1	18

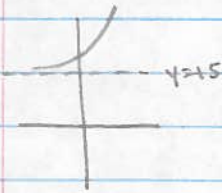
-7	6
-6	5
-3	4
2	3
9	2
18	1

e. $y^{-1} = \sqrt{x+7} - 6$ just the top half of the inverse.



Lesson 5.2.3 p. 237-239: 84-92

84



$y = 2^x$ must be shifted up 15 units

So, $y = 2^x + 15$

this can be any # as long as it is > 1

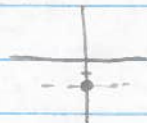
85. $X = 7^y \Rightarrow y = \log_7 X$

86. $\sqrt[3]{n} = \sqrt[3]{49}$
 $n = 3.66$

87. $x^2 + (y+2)^2 = r^2 \Rightarrow C(0, -2)$

$(x+2)^2 + (y-3)^2 = (2r)^2$

$(x+2)^2 + (y-3)^2 = 4r^2$



88. $t = \$$ of tacos
 $B = \$$ of Burritos

$4t = 3B \Rightarrow 8t = 6B$

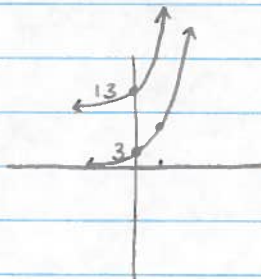
$5t + 6B = 8.58$

$5t + 8t = 8.58$

$13t = 8.58$

$t = 3.66$

89. $y = 3(2^x)$
 $y = 3(2^x) + 10$



$\begin{array}{r} 0 \overline{)3} \\ 1 \overline{)6} \end{array}$

$\begin{array}{r} 0 \overline{)13} \\ 1 \overline{)16} \end{array}$

90. a. $|x-1| = 9$

$$\begin{array}{l} \swarrow \\ x-1=9 \\ \searrow \end{array} \quad \begin{array}{l} \swarrow \\ x-1=-9 \\ \searrow \end{array}$$

$$\boxed{x=10, x=-8}$$

b. $2|x+1| + 3 = 9$

$$2|x+1| = 6$$

$$|x+1| = 3$$

$$\begin{array}{l} \swarrow \\ x+1=3 \\ \searrow \end{array} \quad \begin{array}{l} \swarrow \\ x+1=-3 \\ \searrow \end{array}$$

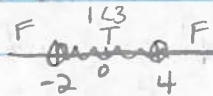
$$\boxed{x=2, x=-4}$$

c. $|x-1| < 3$

$$|x-1| = 3$$

$$\begin{array}{l} \swarrow \\ x-1=3 \\ \searrow \end{array} \quad \begin{array}{l} \swarrow \\ x-1=-3 \\ \searrow \end{array}$$

$$x=4 \quad x=-2$$



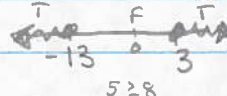
$$\boxed{-2 < x < 4}$$

d. $|x+5| \geq 8$

$$|x+5| = 8$$

$$\begin{array}{l} \swarrow \\ x+5=8 \\ \searrow \end{array} \quad \begin{array}{l} \swarrow \\ x+5=-8 \\ \searrow \end{array}$$

$$x=3 \quad x=-13$$



$$\boxed{x \leq -13 \text{ or } x \geq 3}$$

91. a. $x^2 + 8x$

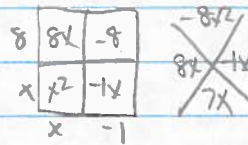
$$\boxed{x(x+8)}$$

b. $x^2y^2 - 81z^2$

$$\boxed{(xy+9z)(xy-9z)}$$

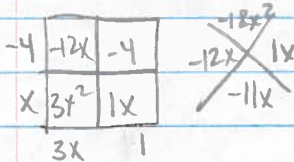
c. $2x^2 + 14x - 16$

$$2(x^2 + 7x - 8)$$



$$\boxed{2(x+8)(x-1)}$$

d. $3x^2 - 11x - 4$



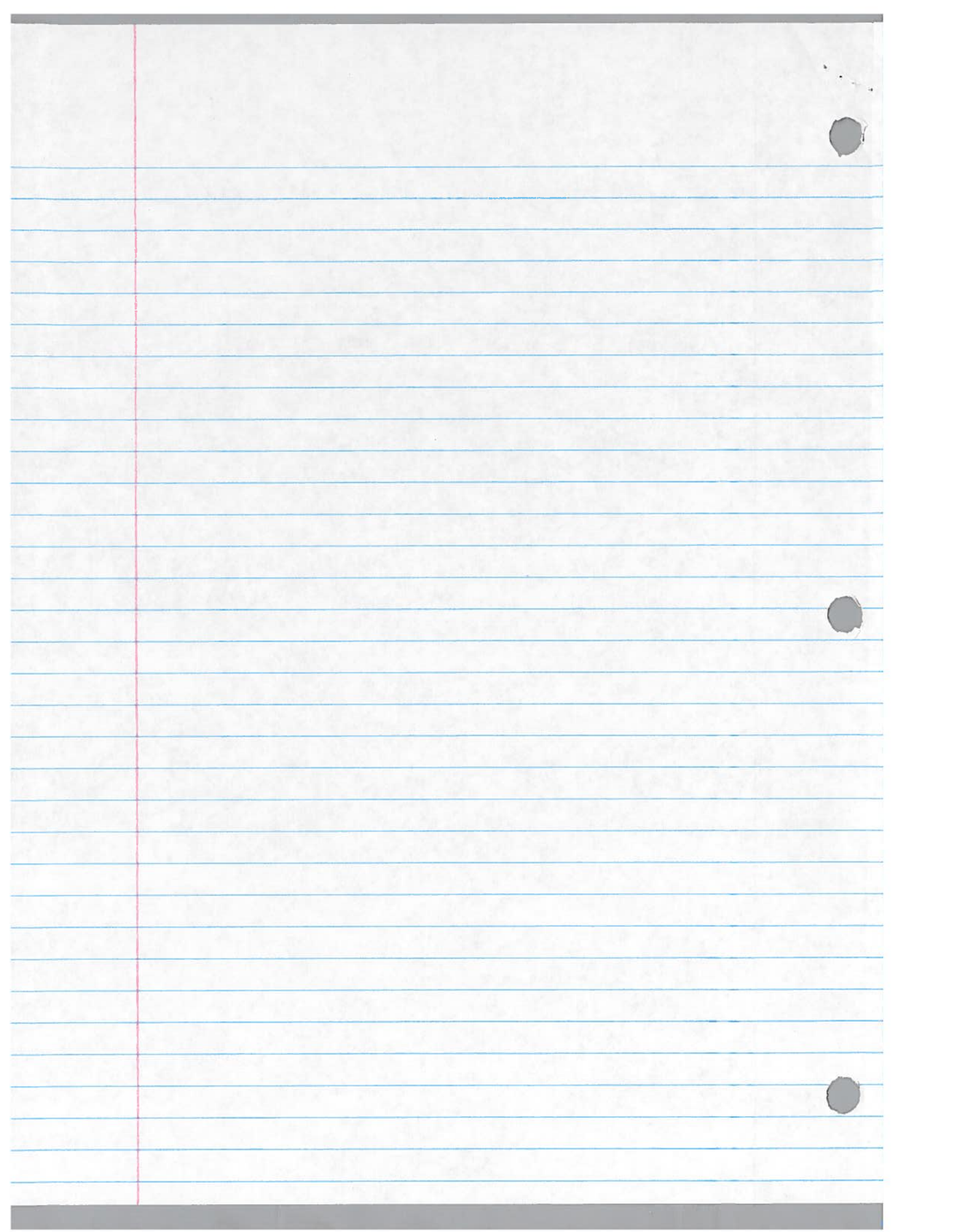
$$\boxed{(x-4)(3x+1)}$$

$$92. a. \frac{2-x}{x+4} + \frac{3x+6}{x+4} = \frac{2x+8}{x+4} = \frac{2(x+4)}{x+4} = \boxed{2}$$

$$b. \frac{3}{(x+2)(x+3)} + \frac{x}{(x+2)(x+3)} = \frac{x+3}{(x+2)(x+3)} = \boxed{\frac{1}{x+2}}$$

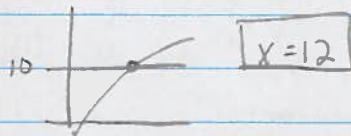
$$c. \frac{(x+3) \cdot 3}{(x+2) \cdot x - 1} - \frac{2 \cdot (x-1)}{x-2 \cdot (x-1)} = \frac{3x+6}{(x-2)(x-1)} - \frac{2x-2}{(x-2)(x-1)} = \boxed{\frac{x-4}{(x-2)(x-1)}}$$

$$d. \frac{(x+2) \cdot 8}{(x+2) \cdot x} - \frac{4 \cdot x}{x+2 \cdot x} = \frac{8x+16}{x(x+2)} - \frac{4x}{x(x+2)} = \frac{4x+16}{x(x+2)} = \boxed{\frac{4(x+4)}{x(x+2)}}$$



Lesson 5.2.4 p. 241-242: 96-104

96. $\log 10 \approx .926628408$ a. let $x = \text{base \#}$, so $x^{.926628408} = 10$
 $\log 100 \approx 1.853256816$
 $\log 1000 \approx 2.779885224$



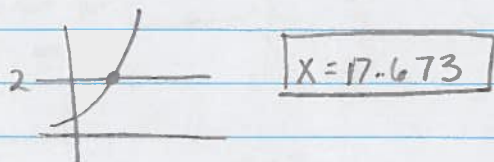
b. 12 fingers b/c it is base 12

97. a. $\log_x(25) = 1$ b. $x = \log_3(9)$ c. $3 = \log_7(x)$
 $25 = x^1$ $9 = 3^x$ $x = 7^3$
 $x = 25$ $x = 2$ $x = 343$

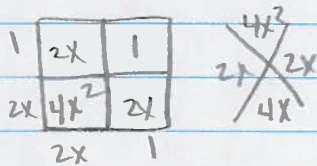
d. $\log_3(x) = \frac{1}{2}$ e. $3 = \log_x(27)$ f. $\log_{10}(10000) = x$
 $x = 3^{\frac{1}{2}}$ $27 = x^3$ $10000 = 10^x$
 $x = \sqrt{3}$ $x = 3$ $x = 4$

98. $\log(.3) = \log_{10}(.3)$ is less than 1 b/c when $10^x = .3$, this means that x must be less than 1
 ex: $10^1 = 10$, $10^2 = 100$, so $x < 1$ to get smaller numbers.

99. $1.04^x = 2$ - use a graph



100. a. $4x^2 - 1$ b. $4x^2 + 4x + 1 = (2x+1)(2x+1)$ or $(2x+1)^2$
 $(2x+1)(2x-1)$



100. c. $2y^2 + 5y + 2$

2	4y	2
1	2y ²	1y

~~$\begin{matrix} 4y^2 \\ 4y & 1y \\ 5y \end{matrix}$~~

$2y \quad 1$

$(y+2)(2y+1)$

d. $3m^2 - 5m - 2$

-2	-6m	-2
m	3m	1m

~~$\begin{matrix} -6m^2 \\ -6m & 1m \\ -5m \end{matrix}$~~

$3m \quad 1$

$(m-2)(3m+1)$

101. a. $x^2 - 2x < 3$

$$x^2 - 2x = 3$$

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

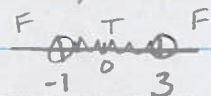
-3	-3x	-3
x	x ²	1x

~~$\begin{matrix} -3x^2 \\ -3x & 1x \\ -2x \end{matrix}$~~

$x \quad 1$

$$(x-3)(x+1) = 0$$

3, -1



$-1 < x < 3$

b. $3x - x^2 \leq 2$

$$3x - x^2 = 2$$

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

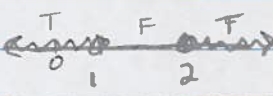
-2	-2x	2
x	x ²	-1x

~~$\begin{matrix} 2x^2 \\ -2x & -1x \\ -3x \end{matrix}$~~

$x \quad -1$

$$(x-2)(x-1) = 0$$

2, 1



$x \leq 1 \text{ or } x \geq 2$

102. $\log_3(2) = \log_2(3) ?$

NO

must be < 1
 $3^x = 2$

must be > 1
 $2^x = 3$

103. $y = ab^x$

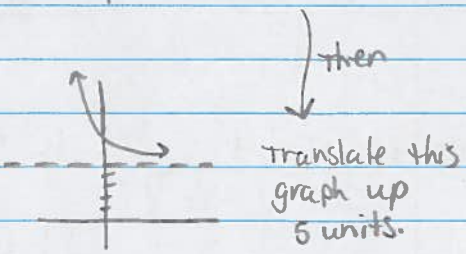
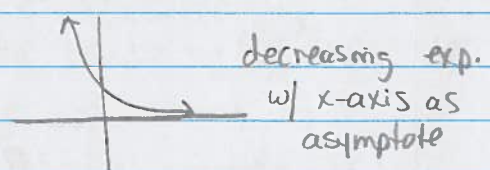
a. solve for a

$\frac{y}{b^x} = a$

b. solve for b

$b = \sqrt[x]{\frac{y}{a}}$

104.



Chapter 5 closure p. 250-252: 126-135

126. a. $y = 3x - 2$

$x = 3y - 2$

$x + 2 = 3y$

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

b. $y = \frac{x+1}{4}$

$4x = \frac{y+1}{4} \cdot 4$

$4x = y + 1$

$y^{-1} = 4x - 1$

c. $y = x^3 + 1$

$x = y^3 + 1$

$\sqrt[3]{x-1} = \sqrt[3]{y^3}$

$y^{-1} = \sqrt[3]{x-1}$

d. $y = 1 + \sqrt{x+5}$

$x = 1 + \sqrt{y+5}$

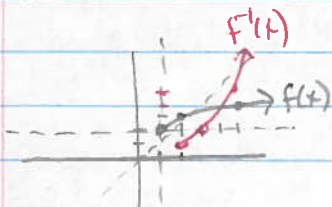
$(x-1)^2 = (\sqrt{y+5})^2$

$(x-1)^2 = y+5$

$y^{-1} = (x-1)^2 - 5$

127. $f(x) = 2 + \sqrt{x-1}$

a. $(1, 2)$



D: $x \geq 1$

R: $y \geq 2$

b. $x = 2 + \sqrt{y-1}$

$(x-2)^2 = (\sqrt{y-1})^2$

$(x-2)^2 = y-1$

$y^{-1} = (x-2)^2 + 1$

$f^{-1}(x) = (x-2)^2 + 1$

$v(2, 1)$

c. See Graph.

d. $f^{-1}(f(5))$

$f(5) = 2 + \sqrt{5-1} = 2 + \sqrt{4} = 4$

$f^{-1}(4) = (4-2)^2 + 1 = 4 + 1 = 5$

$f(f^{-1}(5)) = 5$

$f^{-1}(5) = (5-2)^2 + 1 = 9 + 1 = 10$

$f(10) = 2 + \sqrt{10-1} = 2 + \sqrt{9} = 5$

128. a. $\log_8 64 = x \Rightarrow 8^x = 64 \Rightarrow x = 2$

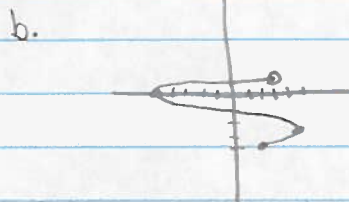
b. $\log_9(x) = \frac{1}{2} \Rightarrow 9^{\frac{1}{2}} = x \Rightarrow x = 3$

c. $\log_3(3^4) = x \Rightarrow 3^x = 3^4 \Rightarrow x = 4$

d. $10^{\log_{10}(4)} = x \Rightarrow \log_{10}(x) = \log_{10}(4) \Rightarrow x = 4$

e. They undo each other, so they are inverses.

129. a. $D: -4 \leq x < 3$
 $R: -5 \leq y \leq 5$
 Function



2	-4
5	-3
-5	6
-1	3

Inverse is not a function b/c it fails VLT

130. $100\% + 4\% = 104\% = 1.04$

a. $y = 3.89(1.04)^{-10} = \boxed{\$2.63}$

b. $10 = \frac{3.89(1.04)^x}{3.89}$

$\frac{10}{3.89} = 1.04^x \Rightarrow \log_{1.04} \left(\frac{10}{3.89} \right) = x \Rightarrow \approx \boxed{24 \text{ years}}$

or use guess & check

131. a. $\frac{5x}{x+3} + \frac{3+x}{x^2+9} = \frac{\cancel{x} \cdot 5x}{(x-3)(x+3)} + \frac{3+x}{(x+3)(x-3)}$

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

$= \boxed{\frac{5x^2 - 14x + 3}{(x-3)(x+3)}}$

$\begin{array}{|c|c|c|} \hline -3 & -15x & 3 \\ \hline x & 5x^2 & 1 \\ \hline 5x & 1 & \\ \hline \end{array}$ ~~$\begin{array}{|c|c|} \hline 15x^2 & \\ \hline -14x & \\ \hline \end{array}$~~
 doesn't factor

b. $\frac{x}{x-1} - \frac{1}{1(x-1)} = \frac{x}{x-1} - \frac{x-1}{x-1} = \boxed{\frac{1}{x-1}}$

c. $\frac{x^2+5x+6}{x^2-4x} - \frac{4x}{x+2} = \frac{(x+3)(x+2)}{x(x-4)} - \frac{4x}{x+2} = \boxed{\frac{4(x+3)}{x-4}}$

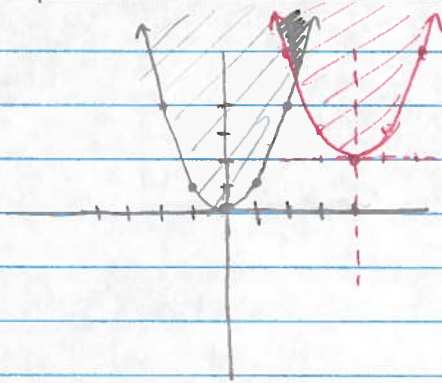
$\begin{array}{|c|c|c|} \hline 3 & 3x & 6 \\ \hline x & x^2 & 2x \\ \hline x & 2 & \\ \hline \end{array}$ ~~$\begin{array}{|c|c|} \hline 6x^2 & \\ \hline 3x & 2x \\ \hline 5x & \\ \hline \end{array}$~~

$$131 \text{ d. } \frac{x^2 - 2x}{x^2 - 4x + 4} \div \frac{4x^2}{x-2} = \frac{x(x-2)}{(\cancel{x-2})(\cancel{x-2})} \cdot \frac{\cancel{x-2}}{4x^2} = \frac{1}{4x}$$

-2	-2x	4
x	x^2	-2x
x	-2	

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

$$132. \quad y \geq x^2, \quad y \geq (x-4)^2 + 2 \quad \checkmark(4, 2)$$



The red parabola is shifted 4 right, 2 up.

133. a. Exponential

$$y = 3 \cdot (0.5)^x$$

b. Linear

$$m = \frac{-7 - 3}{-3 - 3} = \frac{-4}{-6} = \frac{2}{3}$$

$$y = mx + b$$

$$-3 = \frac{2}{3}(3) + b$$

$$-3 = 2 + b$$

$$-5 = b$$

$$y = \frac{2}{3}x - 5$$

c. Parabola

x-int: (-3, 0) & (2, 0)

if $x = -3$ $x = 2$

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

d. Circle, $c(1, 4)$, $r = 4$

$$(x-1)^2 + (y-4)^2 = 16$$

3	3x	-6
x	x^2	-2x
x	-2	

$$y = x^2 + x - 6$$

or

$$y = (x+3)(x-2)$$

134. a. $3x^2 + 11x + 10$

2	$6x$	10
\times	$3x^2$	$5x$
	$3x$	5

~~$\begin{matrix} 30x^2 \\ 6x \quad 5x \\ 11x \end{matrix}$~~

$(x+2)(3x+5)$

b. $6x^3 - 31x^2 + 5x$

$x(6x^2 - 31x + 5)$

-5	$-30x$	5
\times	$6x^2$	$-1x$
	$6x$	-1

~~$\begin{matrix} 30x^2 \\ -30x \quad -1x \\ -31x \end{matrix}$~~

$x(x-5)(6x-1)$

c. $6ab^2 + 15ab - 21a$

$3a(2b^2 + 5b - 7)$

7	$7b$	-7
$2b$	$2b^2$	$-2b$
	b	-1

~~$\begin{matrix} 14b^2 \\ 7b \quad -2b \\ 5b \end{matrix}$~~

$3a(2b+7)(b-1)$

d. $y^2 + 5y - 24$

8	$8y$	-24
y	y^2	$-3y$
	y	-3

~~$\begin{matrix} 24y^2 \\ 8y \quad -3y \\ 5y \end{matrix}$~~

$(y+8)(y-3)$