Lesson 6.1.1 p. 259-260: 9, 11, 12, 13, 14, 15

9. $3x+8=2 \rightarrow 3x=-6$

$7x+3y=1 \qquad x=-2$

$-14+3y=1$

$3y=15$ $\boxed{(-2, 5)}$

$y=5$

11. a. $10^x=16$, $\log_{10} 16 = x$, $\boxed{x=1.204}$

b. $10^x=41$, $\log_{10} 41 = x$, $\boxed{x=1.613}$

c. $3^x=729$, $\log_3 729 = x$, $\boxed{x=6}$

d. $10^x=101$, $\log_{10} 101 = x$, $\boxed{x=2.004}$

12. a. $5^{-2} = \boxed{\frac{1}{25}}$ b. $xy^{-2} = \boxed{\frac{x}{y^2}}$ c. $(xy)^{-2} = \boxed{\frac{1}{x^2y^2}}$ d. $a^3b^4a^{-4}b^6$

$a^{-1}b^{10} = \boxed{\frac{b^{10}}{a}}$

13. a. $\frac{3x}{x^2+2x+1} \div \frac{3}{x^2+2x+1} = \frac{3x}{x^2+2x+1} \cdot \frac{x^2+2x+1}{3} = \boxed{x}$

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

14. $(-2,0)$ and $(0,1)$

a. $m = \frac{0-1}{-2-0} = \frac{-1}{-2} = \boxed{\frac{1}{2}}$

b. $m_\perp = \boxed{-2}$

c. Slopes of $\perp$ lines are opposite and reciprocal. When I mult. them together, I will always get a product of -1.

15. Heather is correct b/c a 4% decrease does not undo a 4% increase.

Lesson 6.1.2 & 6.1.3

Lesson 6.1.2 p. 263-265: 23, 25, 26, 27, 28, 29

23. a. Parabola, down, v(-4,2), vertical stretch = 2 $\boxed{y=-2(x+4)^2+2}$

b. Hyperbola, shift 2 right $\boxed{y=\frac{1}{x-2}}$

c. Cubic, shift up 3, Reflect over y=3 $\boxed{y=-x^3+3}$

25 a. $2x+x=b$

$3x=b$

$\boxed{x=\frac{b}{3}}$

b. $2ax+3ax=b$

$5ax=b$

$\boxed{x=\frac{b}{5a}}$

c. $x+ax=b$

$x(1+a)=b$

$\boxed{x=\frac{b}{1+a}}$

26. a. let $x=3 \rightarrow 3+2=5 \rightarrow 5^2-4(5)=25-20=5 \rightarrow \sqrt{5+4}=3$

let $x=-3 \rightarrow -3+2=-1 \rightarrow (-1)^2-4(-1)=1+4=5 \rightarrow \sqrt{5+4}=3$

$\boxed{\text{NO,}}$ I found a value that disproves Mark's claim.

b. Neg. numbers don't give the same # I started with... the answer is always the abs. val. of what you start with.

c. $n+2 \rightarrow (n+2)^2-4(n+2)$

$n^2+4n+4-4n-8 \rightarrow \sqrt{n^2-4+4}$

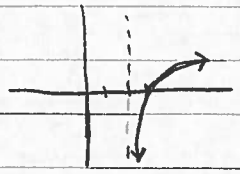
$= \underline{n^2-4}$ $\qquad \sqrt{n^2} = \underline{|n|}$

2	2n	4
n	n^2	2n
	n	2

So, $n+2 \rightarrow n^2-4 \rightarrow |n|$

d. b/c $\sqrt{x^2}=|x|$

27. $y = \log_5(x-2)$ This graph is increasing as x gets larger and is shifted right 2 units.



28. a. $m = \frac{13.6 - 26.3}{1900 - 1950} = \frac{-12.7}{-50}$ .254 million/year or 254,000 people/yr

b. $m = \frac{35.0 - 113.7}{1960 - 2010} = \frac{-78.7}{-50}$ = 1.574 million/yr or 1,574,000 people/yr

c. between 1960-2010 the pop. growth rate was higher.

29. $f(x) = -2x^2 - 4$ and $g(x) = 5x + 3$

a. $g(-2) = 5(-2) + 3 = \boxed{-7}$

b. $f(-7) = -2(-7)^2 - 4 = -98 - 4 = \boxed{-102}$

c. $f(g(-2)) = g(-2) = -7$
$f(-7) = \boxed{-102}$

d. $f(g(1)) = g(1) = 5(1) + 3 = 8$
$f(8) = -2(8)^2 - 4 = -128 - 4 = \boxed{-132}$

Lesson 6.1.3 p.267-268: 36-43

36. $2^7 = 128$ is $\log 2^7 = \log 128$ true?

yes yes

37. if $y=24$, then $\log 24 = \log y$ b/c taking the log. of both sides doesn't change the equivalence.

38. line 1: y-int = 4, $m = -1$ so $y = -x+4$ & shade below
line 2: y-int = 0, $m = \frac{1}{3}$ so $y = \frac{1}{3}x$ & shade above

So, $\boxed{y \le -x+4 \quad y \ge \frac{1}{3}x}$

39. a. $\frac{2x^3+5x^2-3x}{4x^3-4x^2+x} = \frac{x(2x^2+5x-3)}{x(4x^2-4x+1)} = \frac{(x+3)(2x-1)}{(2x-1)(2x-1)} = \boxed{\frac{x+3}{2x-1}}$

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

$-6x^2$: $6x \cdot -1x$, $5x$

-1	-2x	1
2x	$4x^2$	-2x
	2x	-1

$4x^2$: $-2x \cdot -2x$, $-4x$

b. $\frac{3x^2-5x-2}{2x^2-11x+15} \cdot \frac{2x^2-5x}{3x^3-5x^2-2x} = \frac{3x^2-5x-2}{(x-3)(2x-5)} \cdot \frac{x(2x-5)}{x(3x^2-5x-2)} = \boxed{\frac{1}{x-3}}$

-3	-6x	15
x	$2x^2$	-5x
	2x	-5

$30x^2$: $-6x \cdot -5x$, $-11x$

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

$(\sqrt{3x+1})^2 = (x-3)^2$

$3x+1 = x^2-6x+9$

$0 = x^2-9x+8$

-3	3x	9
x	x^2	-3x
	x	-3

$-8x$: $-8 \cdot x$, $-9x$

-8	-8x	8
x	x^2	-1x
	x	-1

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

$x=8$ $x=1$ ← Extraneous

Check $x=8$: $\sqrt{25} - 8 = -3$

$5 - 8 = -3$ ✓

Check $x=1$: $\sqrt{4} - 1 = -3$

$2 - 1 \neq -3$

b. $\boxed{x=1 \text{ is an extraneous solution}}$

41. a. $(x+4)(2x-5)=0$

$x=-4, \quad x=\frac{5}{2}$

b. $(x+4)(x^2-5x+6)=0$

$(x+4)(x-2)(x-3)=0$

$x=-4, \quad x=2, \quad x=3$

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

$6 \cdot 1$, $-2 \cdot -3$, $-2x - 3x = -5x$

c. $3x(x+1)(2x-7)(3x+4)^2(x-13)(x+7)=0$

$x=0, \quad x=-1 \quad x=\frac{7}{2} \quad x=-\frac{4}{3} \quad x=13 \quad x=-7$

d. Set each factor equal to zero & solve for the variable.

42. a. $f(x)=3x^3+2$ $\quad f(-x)=3(-x)^3+2=-3x^3+2$

Since $f(-x) \neq f(x)$ and $f(-x) \neq -f(x)$

the function is **neither**

b. $y=x^6+x^4$ $\quad f(-x)=(-x)^6+(-x)^4=x^6+x^4$

Since $f(-x)=f(x)$, the function is **Even**

43. $(2^x)(3^y)(5^z)=(2^3)(3^{x-2})(5^{2x-3y})$

$x=3$ $\quad y=x-2$ $\quad z=2x-3y$

$y=3-2$ $\quad z=6-3$

$y=1$ $\quad z=3$

Lesson 6.1.4 p. 271 – 273: 51 – 59

51. $2x+y-3z=-12$
$5x-y+z=11$
$x+3y-2z=-13$

$2x+y-3z=-12$
$5x-y+z=11$
$7x-2z=-1$
$7-2z=-1$
$-2z=-8$
$z=4$

$2(1)+y-3(4)=-12$
$2+y-12=-12$
$y=-2$

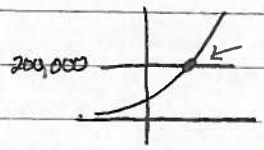
$(5x-y+z=11)\cdot 3$
$x+3y-2z=-13$
$15x-3y+3z=33$
$(16x+z=20)\cdot 2$
$7x-2z=-1$
$32x+2z=40$
$39x=39$
$x=1$

$(1,-2,4)$

52. \$110,000
100% + 2.5% = 102.5% = 1.025

a) $y=110{,}000(1.025)^{10}=\$140{,}809.30$

b) $200{,}000=110000(1.025)^{x}$



$x \approx 24.2$ years

c) $100\%-5\%=95\%=.95$
$y=182{,}500(.95)^2$
$=\$164{,}766.25$

53. $(\sqrt{5x-1})^2=(\sqrt{6+4x})^2$
$5x-1=6+4x$
$x=7$

$\sqrt{35-1}=\sqrt{6+28}$
$\sqrt{34}=\sqrt{34}$ ✓

54. a. 4^2 does equal 2^4 ... This is a special case b/c $3^2 \neq 2^3$
b. $\log 4^2=1.204$ & $\log 2^4=1.204$ yes they are equal
c. $x=5$ & $\log x=\log 5$ are equivalent b/c they have the same solutions
d. $\log 7=\log x^2$ is equivalent to $7=x^2$ b/c they have the same solutions.

55. a. $\log 10 = \log(2x-3) \Rightarrow$ $10 = 2x-3$

$13 = 2x$

$\boxed{x = 6.5}$

b. $\log 25 = \log(4x^2-5x-50) \Rightarrow$ $25 = 4x^2-5x-50$

$0 = 4x^2-5x-75$

$(x-5)(4x+15)=0$

$x=5$ $\quad x=\frac{-15}{4}$

$\boxed{x=-3.75}$

-5	$-20x$	-75
x	$4x^2$	$15x$
	$4x$	15

$-300x^2$, $-20x$, $15x$, $-5x$

1,300
2,150
3,100
4.75
5.60
6.50
10.30
12.25
15.20

56. a. $m=\frac{1}{3}$ thru $(0,5)$

$y=mx+b$

$5=\frac{1}{3}(0)+b$

$b=5$

$\boxed{y=\frac{1}{3}x+5}$

b. $\parallel$ to $y=2x-5$, thru $(1,7)$

$y=mx+b$

$7=2(1)+b$

$5=b$

$\boxed{y=2x+5}$

c. $\perp$ to $y=2x-5$, thru $(1,7)$

$y=mx+b$

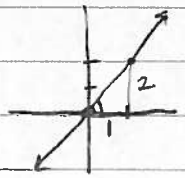
$7=-\frac{1}{2}(1)+b$

$7.5=b$

$\boxed{y=-\frac{1}{2}x+7.5}$

d. Thru $(0,0)$, Tan of angle w/ x-axis $=2$

Slope $=$ Tan $=\frac{opp}{adj}=\frac{2}{1}$



$\boxed{y=2x}$

57. a. $x^2 = x(2x-4) + y$

$x^2 = 2x^2 - 4x + y$

$\boxed{y = -x^2 - 4x}$ or $\boxed{y = x^2 - x(2x-4)}$

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

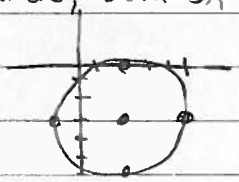
$\sqrt{x-3} = \sqrt{(y-5)^2}$

$y - 5 = \pm\sqrt{x-3}$

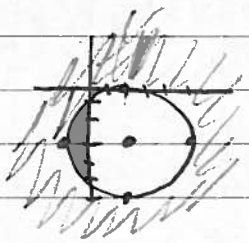
$\boxed{y = \pm\sqrt{x-3} + 5}$

58. a. $(x-2)^2 + (y+3)^2 = 9$

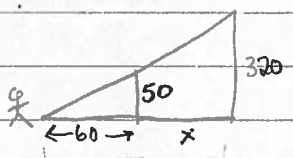
Circle, $C(2,-3)$, $r=3$



b. $(x-2)^2 + (y+3)^2 \geq 9$



59.



$\frac{50}{60} = \frac{320}{60+x}$

$3000 + 50x = 19200$

$50x = 16200$

$x = 324$

distance to hotel

$60 + 324$

$= \boxed{384 \text{ ft}}$

Lesson 6.1.5 (day 1) p. 278-281: 71-79 (omit 78)

71. $x-2y+3z=8$
$2x+y+z=6$
$x+y+2z=12$

$x-2y+3z=8$
$(2x+y+z=6)\cdot 2$
$4x+2y+2z=12$

$5x+5z=20$
$5x+25=20$
$5x=-5$
$x=-1$

$(2x+y+z=6)\cdot -1$
$x+y+2z=12$
$-2x-y-z=-6$

$(-1x+z=6)\cdot 5$
$5x+5z=20$
$-5x+5z=30$

$10z=50$
$z=5$

$-1+y+2(5)=12$
$-1+y+10=12$
$y+9=12$
$y=3$

$(-1, 3, 5)$

72. $(1,5)$, $(3,19)$ and $(-2,29)$ $\quad y=ax^2+bx+c$

$a+b+c=5$
$9a+3b+c=19$
$4a-2b+c=29$

$(a+b+c=5)\cdot -1$
$9a+3b+c=19$
$-a-b-c=-5$

$8a+2b=14$
$24+2b=14$
$2b=-10$
$b=-5$

$(a+b+c=5)\cdot -1$
$4a-2b+c=29$
$-a-b-c=-5$

$(3a-3b=24)\cdot 2$
$(8a+2b=14)\cdot 3$

$6a-6b=48$
$24a+6b=42$

$30a=90$
$a=3$

$3-5+c=5$
$-2+c=5$
$c=7$

$y=3x^2-5x+7$

73 a. $\dfrac{x^2-16}{(x-4)^2}\cdot\dfrac{x^2-3x-18}{x^2-2x-24}=\dfrac{(x+4)(x-4)}{(x-4)(x-4)}\cdot\dfrac{(x-6)(x+3)}{(x-6)(x+4)}=\dfrac{x+3}{x-4}$

	$-6x$	-18
x	x^2	$3x$

x 3 $\quad -18x$, $-6x$, $3x$, $-3x$

	$-6x$	-24
x	x^2	$4x$

x 4 $\quad -24x^2$, $-6x$, $4x$, $-2x$

→

73 b. $\frac{x^2-1}{x^2-6x-7} \div \frac{x^3+x^2-2x}{x-7} = \frac{(x+1)(x-1)}{(x-7)(x+1)} \cdot \frac{x-7}{x(x+2)(x-1)}$ $\quad x(x^2+x-2)$

-7	$-7x$	-7
x	x^2	$1x$
	x	1

$-7x + 1x = -6x$

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

$2x - 1x$

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

74. a. $xy\left(\frac{1}{x} + \frac{1}{2y}\right) = \boxed{y + \frac{x}{2}}$ b. $ab\left(\frac{2}{a} + \frac{4a}{b}\right) = \boxed{\frac{2}{b} + 4a^2}$

c. $2x\left(3 - \frac{1}{2x}\right) = \boxed{6x - 1}$ d. $\boxed{xy}\left(\frac{2}{x} + \frac{7}{y}\right) = 2y + 7x$

This goes in the box

75. a. $y = \log_{12} x$ $\quad \boxed{x = 12^y}$ b. $x = \log_y 17$ $\quad \boxed{17 = y^x}$ c. $y = 1.75^{2x}$ $\quad \boxed{\log_{1.75} y = 2x}$ d. $3y = x^7$ $\quad \boxed{\log_x (3y) = 7}$

76. $\sqrt{3x-6} + 6 = 12$

$(\sqrt{3x-6})^2 = (6)^2$

$3x - 6 = 36$

$3x = 42$

$\boxed{x = 14}$

$\sqrt{42-6} + 6 = 12$

$\sqrt{36} + 6 = 12$

$6 + 6 = 12$ ✓

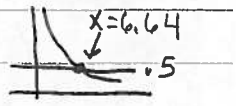
77a. $y = 50(.5)^{10} = \boxed{.049 \text{ grams}}$

b. $\frac{.5}{50} = \frac{50(.5)^x}{50}$

$.05 = (.5)^x$

$\log_{.5}(.01) = x$

$x = 6.64$



or

so $\boxed{x \approx 6640}$

* by 1000

79. a. $16 = \boxed{2^4}$

b. $\frac{1}{8} = \boxed{2^{-3}}$

c. $\sqrt{2} = \boxed{2^{\frac{1}{2}}}$

d. $\sqrt[3]{4} = \sqrt[3]{2^2} = \boxed{2^{2/3}}$

c. Never b/c the exponential graph has the x-axis as an asymptote, so the isotope will technically never reach 0.

Lesson 6.1.5 (day 2) p. 280-281: 80-87

80. $x+2y-z=-1$
$2x-y+3z=13$
$x+y+2z=14$

$2x-y+3z=13$
$+\ x+y+2z=14$
$3x+5z=27$
$-3+5z=27$
$5z=30$
$z=6$

$-1+y+12=14$
$y+11=14$
$y=3$

$(-1, 3, 6)$

$(2x-y+3z=13)\cdot 2$
$+\ x+2y-z=-1$
$4x-2y+6z=26$
$(5x+5z=25)\cdot -1$
$+\ 3x+5z=27$
$-5x-5z=-25$
$-2x=2$
$x=-1$

81. $(-1,10)\ (0,5)\ (2,7)$
$y=ax^2+bx+c$

$10=a(-1)^2+b(-1)+c$
$5=a(0)^2+b(0)+c \Rightarrow$
$7=a(2)^2+b(2)+c$

$a-b+c=10$
$c=5$
$4a+2b+c=7$

$a-b+5=10$
$a-b=5$
$2-b=5$
$-b=3$
$b=-3$

$4a+2b+5=7$
$4a+2b=2$
$+\ (a-b=5)\cdot 2$
$2a-2b=10$
$6a=12$
$a=2$

$y=2x^2-3x+5$

82. a. $a=\log_b 24$ b. $3x=\log_{2y} 7$ c. $3y=2^{5x}$ d. $4p=(2q)^6$

$b^a=24$ $(2y)^{3x}=7$ $\log_2(3y)=5x$ $\log_{2q}(4p)=6$

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

	x	1
1	x	1
x	x^2	x

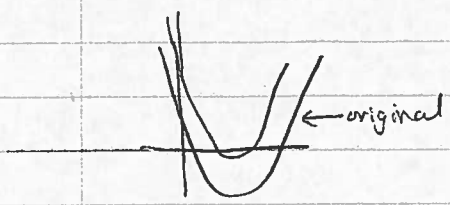
x^2, $1x$, $1x$, $2x$

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

→

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

84 Hannah is correct b/c I compared the graphs



$y = 4x^2 - 24x + 7$ - original

$y = 4(x-3)^2 - 29$ - same as original (Hannah & Raymond)

$y = 4(x-3)^2 - 2$ - not same as origina (Aiden & Sarah)

85. a. $y = 2x^2 - 8x + 7$

$y = 2(x^2 - 4x) + 7$

$y = 2(x^2 - 4x + 4) + 7 - 8$

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

$\boxed{V(2, -1)}$

$\boxed{\text{Symm: } x = 2}$

b. $y = 5x^2 - 10x - 7$

$y = 5(x^2 - 2x) - 7$

$y = 5(x^2 - 2x + 1) - 7 - 5$

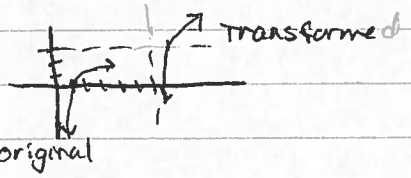
$y = 5(x-1)^2 - 12$

$V(1, -12)$

Symm: $x = 1$

86. Translate $\log x$ up 3, right 6

$\boxed{y = \log(x-6) + 3}$



87. $f(x) = 2x^2 - 4$, $g(x) = 5x + 3$

a. $f(a) = \boxed{2a^2 - 4}$

b. $f(3a) = 2(3a)^2 - 4$

$= 2(9a^2) - 4$

$= \boxed{18a^2 - 4}$

c. $f(a+b) = 2(a+b)^2 - 4$

$= 2(a^2 + 2ab + b^2) - 4$

$= \boxed{2a^2 + 4ab + 2b^2 - 4}$

d. $f(x+7) = 2(x+7)^2 - 4$

$= 2(x^2 + 14x + 49) - 4$

$= 2x^2 + 28x + 98 - 4$

$= \boxed{2x^2 + 28x + 94}$

e. $f(5x+3) = 2(5x+3)^2 - 4$

$2(25x^2 + 30x + 9) - 4$

$50x^2 + 60x + 18 - 4$

$= \boxed{50x^2 + 60x + 14}$

f. $g(f(x)) = 5(2x^2 - 4) + 3$

$= 10x^2 - 20 + 3$

$= \boxed{10x^2 - 17}$

Lesson 6.2.1 p. 284-285: 95-103

95.

x	y
0	1
1	3
2	9
3	27
4	81
5	243
6	729
7	2187
8	6561

96. It doesn't make sense to use logs when you don't know the base # of an exponential.

97. $\log x > 2 \Rightarrow 10^2 = x$, $x = 100$

when $x = 100$, $\log x = 2$

when $x > 100$, $\log x > 2$

98. $0 < b < 1$

99. a. $8^x = 1$ $x = \frac{1}{8}$ b. $x^{?} = 1$ $\frac{1}{x}$ c. $\sqrt[8]{m^8} = \sqrt[8]{40}$ or $(m^8)^{\frac{1}{8}} = (40)^{\frac{1}{8}}$ $m = 1.586$ $m = 1.586$

d. $\sqrt[6]{n^6} = \sqrt[6]{300}$ or $(n^6)^{\frac{1}{6}} = (300)^{\frac{1}{6}}$ $n = 2.587$ $n = 2.587$

e. $x^a = b$ raise both sides to the $\frac{1}{a}$, then type $b^{\frac{1}{a}}$ into calc.

$x = b^{\frac{1}{a}}$

100. $2^{\frac{1}{2}}$ is a fractional exponent which means square root. $2^{\frac{1}{2}} = \sqrt{2}$

2^{-1} is a negative exponent which means reciprocal $2^{-1} = \frac{1}{2}$

101. a. $|x| < 3$

$|x| = 3$

$x = 3 \quad x = -3$

F T F

-3 0 3

$-3 < x < 3$

b. $\left|\frac{2x+1}{|2x+1|}\right| < 3$

$|2x+1| = 3$

$2x+1 = 3 \quad 2x+1 = -3$

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

$x = 1 \quad x = -2$

F T F

-2 0 1

$-2 < x < 1$

c. $|2x+1| \geq 3$

$|2x+1| = 3$

$2x+1 = 3 \quad 2x+1 = -3$

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

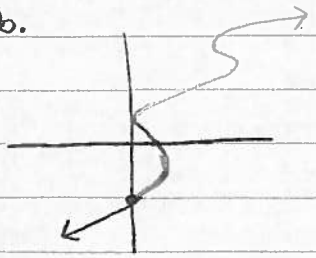
$x = 1 \quad x = -2$

T F T

-2 0 1

$x \leq -2$ or $x \geq 1$

102. a. Yes, the graph is a function

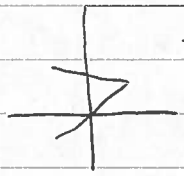
b. 

the inverse is not a function b/c a horizontal line touches the original graph more than once.

c. NO... the inverse of a function does not need to be a function.

d. use the horizontal line test to determine if a function has an inverse that is also a function.

e. Yes... it's possible for the inverse of a non-function to be a function.

ex: 

This non-function's inverse is a function

103. a. $-4x = z - 2y + 12$

$y + z = 12 - x$

$8x - 3y + 4z = 1$

$\Rightarrow$

$-4x + 2y - z = 12$

$x + y + z = 12$

$8x - 3y + 4z = 1$

$-4x + 2y - z = 12$

$x + y + z = 12$

$-3x + 3y = 24$

$(-x + y = 8) \cdot -5$

$-8x - 5y = 49$

$5x - 5y = -40$

$-3x = 9$

$x = -3$

$(-4x + 2y - z = 12) \cdot 4$

$8x - 3y + 4z = 1$

$-16x + 8y - 4z = 48$

$-8x + 5y = 49$

$3 + y = 8$

$y = 5$

$-3 + 5 + z = 12$

$2 + z = 12$

$z = 10$

$(-3, 5, 10)$

103 b. $\begin{cases} 3x+y-2z=6 \\ x+2y+z=7 \\ 6x+2y-4z=12 \end{cases}$

$(3x+y-2z=6)$

$+\ (x+2y+z=7)\cdot 2$

$2x+4y+2z=14$

$5x+5y=20$

$(x+y=4)\cdot -1$

$x+y=4$

$-x-y=-4$

$0=0$

$(x+2y+z=7)\cdot 4$

$+\ (6x+2y-4z=12)$

$4x+8y+4z=28$

$10x+10y=40$

$x+y=4$

This means there are infinitely many solutions

c. The planes intersect in a line.

Lesson 6.2.2 p. 290-291: 113-122

113. a. $(5.825)^{x-3} = 120$

$\log_{5.825}(120) = x - 3$

$x = 5.717$

b. $\frac{18(1.2)^{(2x-1)}}{18} = \frac{900}{18}$

$(1.2)^{2x-1} = 50$

$\log_{1.2}(50) = 2x - 1$

$x = 11.228$

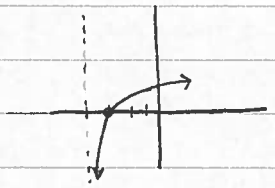
114 a. $\frac{x}{\frac{x}{x} \cdot 1 - \frac{1}{x}} = \frac{x}{\frac{x-1}{x}} = x\left(\frac{x}{x-1}\right) = \frac{x^2}{x-1}$

b. $\frac{\frac{b}{b}\cdot\frac{1}{a} + \frac{1}{b}\cdot\frac{a}{a}}{\frac{1}{b} - a\cdot\frac{b}{b}} = \frac{\frac{b+a}{ab}}{\frac{1-ab}{b}} = \frac{b+a}{ab} \cdot \frac{b}{1-ab} = \frac{b+a}{a(1-ab)}$

115. $\log_2 7 = \frac{\log_5 7}{\log_5 2}$ use your calc. to verify that these 2 expressions are equivalent!

2.807 2.807

116. $y = \log_3(x+4)$



shift the parent graph 4 units to the left.

117. $y = a(b)^x$ where $b = 100\% - 13\% = 87\%$ don't burn out

$100{,}000 = 1{,}000{,}000(.87)^x$

$.1 = (.87)^x$

$\log_{.87}(.1) = x$

$x = 16.5$ months

$1 = 1{,}000{,}000(.87)^x$

$.000001 = (.87)^x$

$\log_{.87}(.000001) = x$

$x = 99.2$ months

118. Yes, they are correct (use your calc. to check graphs!)

V(2.5, -23.75)

Symm: $x = 2.5$

119. a. $f(x) = 4x^2 - 12x + 6$

$f(x) = 4(x^2 - 3x) + 6$

$f(x) = 4(x - 1.5)^2 + 6 - 9$ b/c $(-1.5)^2 = 2.25$ and $4(2.25) = 9$

$f(x) = 4(x-1.5)^2 - 3$

V(1.5, -3)

Symm: $x = 1.5$

b. $g(x) = 2x^2 + 14x + 4$

$g(x) = 2(x^2 + 7x) + 4$

$g(x) = 2(x + 3.5)^2 + 4 - 24.5$ $(3.5)^2 = (12.25)2 = 24.5$

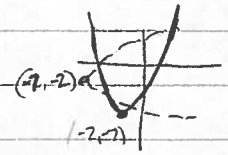
$g(x) = 2(x+3.5)^2 - 20.5$

V(-3.5, -20.5)

Symm: $x = -3.5$

120. $y = 3(x+2)^2 - 7$

a. if V(-2, -7), then D: $x \geq -2$ or $x \leq -2$



b. x → $+2$ → square → $*3$ → -7

$y^{-1} = \pm\sqrt{\frac{(x+7)}{3}} - 2$

so, choose either one

$y^{-1} = \sqrt{\frac{x+7}{3}} - 2$ or $y^{-1} = -\sqrt{\frac{x+7}{3}} - 2$

c.

D: $x \geq -7$	or	D: $x \geq -7$
R: $y \geq -2$		R: $y \leq -2$

121 a. $\frac{3}{(x-4)(x+1)} + \frac{6}{x+1}\cdot\frac{(x-4)}{(x-4)} = \frac{3}{(x-4)(x+1)} + \frac{6x-24}{(x-4)(x+1)} = \frac{6x-21}{(x-4)(x+1)}$

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

b. $\frac{x+2}{x^2-9} - \frac{1}{x+3} = \frac{x+2}{(x+3)(x-3)} - \frac{1}{x+3}\cdot\frac{(x-3)}{(x-3)} =$

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

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

122. $t(n) = 4(5^n)$

a. $\boxed{20, 100, 500, \ldots}$

b. $\frac{312,500}{4} = \frac{4(5^n)}{4}$

$78125 = 5^n$

$\log_5(78125) = n$

$\boxed{n = 7}$

yes, she is correct b/c the term # is 7 or

1	20
2	100
3	500
⋮	
7	312,500

c. $94,500 = 4(5^n)$

$23,625 = 5^n$

$\log_5(23,625) = n$

$n = 6.26$

NO, b/c the term number can't be a neg. # or a decimal

Lesson 6.2.3 p. 294-295 : 127-136

127. a. (3, 135) and (1, 60)

0	(40)	÷1.5
1	60	×1.5
3	135	

$b^2 = \frac{135}{60}$

$b^2 = 2.25$

$b = 1.5$

$y = 40(1.5)^x$

b. $y_1 = 40(1.5)^x$

?	1

or $\frac{1}{40} = \frac{40(1.5)^x}{40}$

$1.5^x = .025$

$\log_{1.5}(.025) = x$

$x = -9$

9 days b/4 NOV. 1 means Oct. 22nd

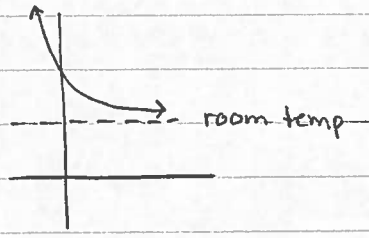
128. $5^{x+3} = 12$ ← Anything where x is an exponent

129. a. $\log(8^{3/3}) = \frac{2}{3}\log(8) = 2\log(8^{\frac{1}{3}}) = \frac{1}{3}\log(8^2) = \log(4)$

b. $-2\log(5) = \log(5^{-2}) = \log(\frac{1}{25}) = -\log(5^2) = -\log(25)$

c. $\log(na)^{bo} = bo\log(na) = b\log(na)^o = 0\log(na)^b = \log(n^{bo}a^{bo})$

130.



The hot chocolate will not get any colder than room temp.

131. (-2, 24), (3, -1) and (-1, 15) → $y = ax^2 + bx + c$

$4a - 2b + c = 24$ ·-1

$9a + 3b + c = -1$

$1a - 1b + c = 15$

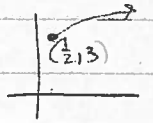
$+4a + 2b + c = -24$
$+9a + 3b + c = -1$
$5a + 5b = -25$
$+15a - 5b = 45$
$20a = 20$
$a = 1$

$-4a - 2b - c = -24$
$+1a - 1b + c = 15$
$(-3a + 1b = -9) \cdot -5$
$-3 + b = -9$
$b = -6$

$1 + 6 + c = 15$
$7 + c = 15$
$c = 8$

$y = 1x^2 - 6x + 8$

132. $f(x) = 3 + \sqrt{2x-1}$ → shift $(\frac{1}{2}, 3)$



a. D: $x \geq \frac{1}{2}$
R: $y \geq 3$

b. x → $*2$ → -1 → $\sqrt{}$ → $+3$

$g(x) = \frac{(x-3)^2+1}{2}$ or $g(x) = \frac{1}{2}(x-3)^2 + \frac{1}{2}$

v $(3, \frac{1}{2})$

c. D: $x \geq 3$
R: $y \geq \frac{1}{2}$

d. $f(g(x)) = x$ b/c an inverse will undo a function

$f(g(x)) = 3 + \sqrt{2\left(\frac{(x-3)^2+1}{2}\right) - 1}$

$= 3 + \sqrt{(x-3)^2 + 1 - 1}$

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

$= 3 + (x-3)$

$= x$

This is the math behind what an inverse does algebraically

e. $g(f(x)) = x$

for the same reason in part d. This only happens because $f(x)$ and $g(x)$ are inverses

133 a. $\sqrt[3]{x^3} = \sqrt[3]{243}$

$x = 6.24$

b. $3^x = 243$

$\log_3(243) = x$

$x = 5$

134 a. $C(1,0)$, $r=3$

$(x-1)^2 + y^2 = 9$

b. $C(-3,4)$, $r=2$

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

135. a. $\frac{x^2}{x-5} - \frac{25}{x-5}$

$= \frac{x^2-25}{x-5}$

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

$= x+5$

b. $\frac{a^2}{a+5} + \frac{10a+25}{a+5}$

$\frac{a^2+10a+25}{a+5} = \frac{(a+5)(a+5)}{a+5} = a+5$

5	5a	25
a	a^2	5a

a 5

$25a^2$ / 5a 5a / 10a

135 c. $\frac{x^2}{x-y} \cdot \frac{2xy-y^2}{x-y} = \frac{x^2-2xy+y^2}{x-y} = \frac{(x-y)(x-y)}{x-y}$

$-y$	$-xy$	y^2
x	x^2	$-xy$
	x	$-y$

x^2y^2, $-xy$, $-xy$, $-2xy$

$= \boxed{x-y}$

d. $\frac{(x-1)\,x}{(x-1)(x+1)} + \frac{(x+1)}{(x-1)\,(x+1)}$

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

136. a. $P(x) = 3(x^3+6)$ — x, cube, $+6$, $*3$ — $\boxed{P^{-1}(x) = \sqrt[3]{\frac{x}{3}-6}}$

b. $K(x) = 3x^3+6$ — x, cube, $*3$, $+6$ — $\boxed{K^{-1}(x) = \sqrt[3]{\frac{x-6}{3}}}$

c. $h(x) = \frac{x+1}{x-1}$ This is a harder one to see

$y = \frac{x+1}{x-1} \Rightarrow \frac{x}{1} \times \frac{y+1}{y-1} \Rightarrow xy-x = y+1$

$\Rightarrow xy-y = x+1$

$y(x-1) = x+1$

$\boxed{h^{-1}(x) = \frac{x+1}{x-1}}$

d. $j(x) = \frac{2}{3-x}$ — x, $*-1$, $+3$, reciprocal, $*2$ — $\frac{x}{2} \rightarrow \left(\frac{2}{x}-3\right)\cdot -1$

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

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

$x(3-y) = 2$

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

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

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

same answer

$\boxed{j^{-1}(x) = -\frac{2}{x}+3}$

Lesson 6.2.4 p. 299-301: 138-147

138 Trade-in value decreases 20% each year

a. decreasing by 20% means you retain 80%, so the multiplier is .8 which implies exponential.

b. $y = 23,500(.8)^x$

c. $y = 23,500(.8)^4 = \$9625.60$

d. $\frac{6000}{23500} = \frac{23,500(.8)^x}{23500}$

$.8^x = .2553$

$\log_{.8}(.2553) = x$

$x = 6.12$ yrs

e. $y = 23500(.8)^{-2.7}$

$= \$42,926.44$

139 a. $x = \log_{25}(5)$

$25^x = 5$

$x = \frac{1}{2}$

b. $\log_x(1) = 0$

$x^0 = 1$

x = any number except 1

c. $23 = \log_{10} x$

$10^{23} = x$

140 a. $\sqrt[4]{x^6} = \sqrt[4]{125}$

$x = 2.236$

b. $\sqrt[3.8]{x^{3.8}} = \sqrt[3.8]{240}$

$x = 4.230$

c. $x^{-4} = 100$

$\frac{1}{x^4} = \frac{100}{1}$

$100x^4 = 1$

$\sqrt[4]{x^4} = \sqrt[4]{.00}$

$x = .316$

d. $\sqrt[3]{(x+2)^3} = \sqrt[3]{65}$

$x + 2 = \sqrt[3]{65}$

$x = \sqrt[3]{65} - 2$

$x = 2.021$

e. $\frac{2(x-2)^{12.5}}{2} = \frac{2486}{4}$

$\sqrt[12.5]{(x-2)^{12.5}} = \sqrt[12.5]{621.5}$

$x - 2 = \sqrt[12.5]{621.5}$

$x = 3.673$

141. $f(x) = x^4$, $g(x) = 3(x+2)$

a. $f(2) = 2^4 = \boxed{16}$ b. $g(2) = 3(2+2) = \boxed{12}$

c. $f(g(2)) = (12)^4 = \boxed{20,736}$ d. $g(f(2)) = 3(16+2) = \boxed{54}$

e. NO, $f(x)$ & $g(x)$ are not inverses b/c I didn't get the value of $f(g(2)) = 2$ or $g(f(2)) = 2$.

142. $x \xrightarrow{+5} \sqrt{\ }$ she would need to sq the #, then subtract 5

$9^2 - 5 = 81 - 5 = \boxed{76}$

143. $\boxed{C(x) = x^2 - 5}$

144. $y = (x-17)^2$ has a line of symm. at $\boxed{x = 17}$

145. a. $\dfrac{4}{x^2+5x+6} + \dfrac{2x}{x+2} = \dfrac{4}{(x+3)(x+2)} + \dfrac{2x}{x+2} \cdot \dfrac{(x+3)}{(x+3)}$

3	$3x$	6
x	x^2	$2x$
	x	2

$6x^2$, $3x$, $2x$, $5x$

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

2	$2x$	2
x	x^2	$1x$
	x	1

$2x^2$, $2x$, $1x$, $3x$

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

$= \boxed{\dfrac{2(x+1)}{x+3}}$

145 b. $\frac{3x^2+x}{(2x+1)^2} - \frac{3}{2x+1}\cdot\frac{(2x+1)}{(2x+1)} = \frac{3x^2+x}{(2x+1)(2x+1)} - \frac{6x+3}{(2x+1)(2x+1)}$

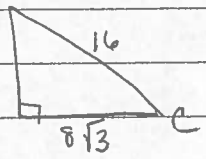
$$= \frac{3x^2-5x-3}{(2x+1)(2x+1)}$$

	-3
$3x^2$	

$-9x^2$, $-5x$

doesn't factor

146 a.

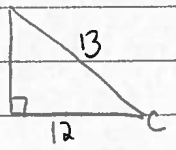


$\cos C = \frac{8\sqrt{3}}{16}$

$C = \cos^{-1}\left(\frac{8\sqrt{3}}{16}\right)$

$C = 30^\circ$

b.



$\cos C = \frac{12}{13}$

$C = \cos^{-1}\left(\frac{12}{13}\right)$

$C = 22.6^\circ$

147.

$x \geq -3$

$x \leq 3$

$y \leq -\frac{3}{4}x + 3$

$y \geq -\frac{3}{4}x - 3$

Chapter 6 Closure p. 307-308: 149-159

149. a. $x+y+z=3$
$(2x-y+2z=6)\cdot 2$
$3x+2y-z=13$

$x+y+z=3$
$2x-y+2z=6$
$3x+3z=9$
$-7x-3z=-25$
$-4x=-16$
$x=4$

$4x-2y+4z=12$
$+\ 3x+2y-z=13$
$7x+3z=25)\cdot -1$
$28+3z=25$
$3z=-3$
$z=-1$

$12+2y+1=13$
$13+2y=13$
$2y=0$
$y=0$

$(4, 0, -1)$

b. $(x+y+4z=5)\cdot -1$
$-2x+2z=3$
$3x+y-2z=0$

$-x-y-4z=-5$
$3x+y-2z=0$
$2x-6z=-5$
$-2x+2z=3$
$-4z=-2$
$z=\frac{1}{2}$

$-2x+1=3$
$-2x=2$
$x=-1$

$-1+y+2=5$
$y+1=5$
$y=4$

$(-1, 4, \frac{1}{2})$

150. $(2,3)$, $(-1,6)$ and $(0,3)$ $\quad y=ax^2+bx+c$

a. $3=4a+2b+c$
$6=1a-1b+c$
$3=c$

$3=4a+2b+3$
$0=4a+2b$
$6=2a-2b$
$6=6a$
$a=1$

$6=a-b+3$
$(3=a-b)\cdot 2$

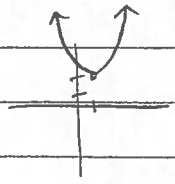
$6=1-b+3$
$6=-b+4$
$2=-b$
$b=-2$

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

b. $y-3=x^2-2x+1$
$+1 \quad +1$
$y-2=(x-1)^2$
$y=(x-1)^2+2$

$V(1,2)$

c. None



151 a. $2^x = 17$

$\log_2 17 = x$

$x = 4.087$

b. $5x^3 = 75$

$\sqrt[3]{x^3} = \sqrt[3]{15}$

$x = 2.466$

c. $5(3^{x+1}) = 85$

$3^{x+1} = 17$

$\log_3 17 = x+1$

$x = 1.579$

d. $\log_3(x+1) = -2$

$3^{-2} = x+1$

$x = -.889$

152. $100\% + 4\% = 104\% = 1.04$

a. $y = 3.59(1.04)^{-10}$

$y = \$2.43$

b. $10 = 3.59(1.04)^x$

$1.04^x = 2.79$

$\log_{1.04}(2.79) = x$

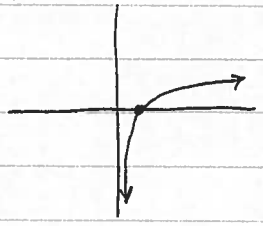
$x = 26.12$ yrs

153. $y = 2 + \sqrt{2x-4}$

$x \quad x-2 \quad -4 \quad \sqrt{\ } \quad +2$

$y^{-1} = \dfrac{(x-2)^2+4}{2}$

154. $y = \log_2(x)$



155. $y = 1 + \log_2(x-3)$ shift 3 right, 1 up

156. a. $3|2x-5| - 8 = -5$

$3|2x-5| = 3$

$|2x-5| = 1$

$2x-5=1 \qquad 2x-5=-1$

$2x=6 \qquad 2x=4$

$x=3, \quad x=2$

b. $\left(\sqrt{3x^2+11x}\right)^2 = (2)^2$

$3x^2+11x=4$

$3x^2+11x-4=0$

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

$3x \quad -1$

$-12x^2$

$12x \quad -1x$

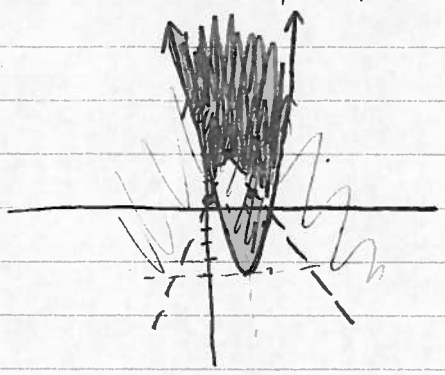
$11x$

$(x+4)(3x-1)=0$

$-4, \quad \frac{1}{3}$

157. a. $y \geq 3(x-2)^2 - 4$ → Parabola, up, solid, V(2, -4)

$y > -2|x-1| + 3$ → V-shape, down, dotted, V(1, 3)



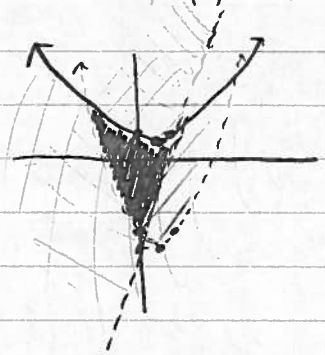
Check (2,0): $0 \geq -4$, T

Check (1,0): $0 > 3$, F

b. $y > (x-1)^2 - 5$ → Parabola, up, dotted, V(1, -5)

$y > 3x - 5$ → line, dotted

$y \leq \frac{1}{2}(x-1)^2 + 1$ → Parabola, up, V(1, 1), solid



Check (0,0): $0 >_T -4$

Check (0,0): $0 > -5$ T

Check (0,0): $0 \leq \frac{3}{2}$ T

158. $f(x) = \sqrt{x+3}$

a. D: $x \geq -3$

R: $y \geq 0$

b. if $g(x) = x - 10$

$f(g(x)) = \sqrt{x-10+3}$

$= \sqrt{x-7}$

c. D: $x \geq 7$

R: $y \geq 0$

d. $g(f(x)) = \sqrt{x+3} - 10$

This is not equal to $f(g(x))$