

Thursday 2/26 6.1.5 (6-71 → 6-7a)

$$\begin{aligned} 6-71) \quad & x - 2y + 3z = 8 \\ & 2x + y + z = 6 \\ & x + y + 2z = 12 \end{aligned}$$

$$\begin{aligned} & x - 2y + 3z = 8 \\ - & \underline{x - y - 2z = -12} \\ & -3y + z = -4 \end{aligned}$$

$$\begin{aligned} -2x + 4y - 6z &= -16 \\ \underline{2x + y + z} &= 6 \\ 5y - 5z &= -10 \end{aligned}$$

$$\begin{aligned} 5(-3y + z &= -4) \\ 5y - 5z &= -20 \\ \underline{-15y + 5z} &= -20 \\ -10y &= -30 \\ y &= 3 \end{aligned}$$

$$\begin{aligned} 5(3) - 5z &= -10 \\ -15(-5z &= -10) \\ -15 & \quad -15 \\ \underline{-5z} &= \underline{-25} \\ -5 & \quad -5 \end{aligned}$$

$$z = +5 \quad \boxed{(-1, 3, 5)}$$

$$\begin{aligned} x - 2(3) + 3(5) &= 8 \\ x - 6 + 15 &= 8 \\ x + 9 &= 8 \\ x &= -1 \end{aligned}$$

$$\begin{aligned} 6-72) \quad 5 &= 1a + 1b + c \\ 19 &= 9a + 3b + c \\ 29 &= 4a - 2b + c \end{aligned}$$

$$\begin{aligned} 29 &= 4a - 2b + c \\ 10 &= 2a + 2b + c \\ \underline{39} &= \underline{6a + 3c} \end{aligned}$$

$$\begin{aligned} 39 &= 6a + 3c \\ -1(41 &= 6a + 2c) \\ \hline \end{aligned}$$

$$\frac{35}{5} = \frac{5c}{5}$$

$$c = 7$$

$$\begin{aligned} 4 &= 6a - 2(7) \\ 6a &= 18 \\ a &= 3 \end{aligned}$$

$$\begin{aligned} 19 &= 9a + 3b + c \\ -15 &= -3a - 3b - 3c \\ \hline 4 &= 6a - 2c \end{aligned}$$

$$\begin{aligned} 5 &= 3 + b + 7 \\ 5 &= 10 + b \\ -5 &= b \end{aligned}$$

$$\boxed{y = 3x^2 - 5x + 7}$$

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

$$\boxed{\frac{x+3}{x-4}}$$

$$b) \frac{x^2-1}{x^2-6x-7} \cdot \frac{x-7}{x(x^2+x-2)} = \frac{(x-1)(x+1)}{(x-7)(x+1)} \cdot \frac{(x-7)}{x(x+2)(x-1)}$$

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

$$6-74) a) xy\left(\frac{1}{x} + \frac{1}{2y}\right) = \frac{xy}{x} + \frac{xy}{2y} = \boxed{y + \frac{x}{2}}$$

$$b) ab\left(\frac{2}{a} + \frac{4a}{b}\right) = \frac{2ab}{a} + \frac{4a^2b}{b} = \boxed{2b + 4a^2}$$

$$c) 2x\left(3 - \frac{1}{2x}\right) = 6x - \frac{2x}{2x} = \boxed{6x - 1}$$

$$d) \boxed{xy}$$

$$6-75) a) 12^y = x$$

$$b) y^x = 17$$

$$c) \log_{0.175} y = 2 \cdot x$$

$$d) \log_x 3y = 7$$

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

$$\begin{array}{r} \sqrt{3x-6} + 6 = 12 \\ -6 \quad -6 \\ \hline (\sqrt{3x-6})^2 = (6)^2 \end{array}$$

$$3x-6 = 36$$

$$+6 \quad +6$$

$$\frac{3x}{3} = \frac{42}{3}$$

$$\boxed{x = 14}$$

$$6-77) a) t(n) = 50 \cdot \left(\frac{1}{2}\right)^{10} = .0488 \text{ grams}$$

$$b) .01 \cdot 50 = .5$$

$$\frac{.5}{50} = \frac{50 \left(\frac{1}{2}\right)^x}{50}$$

$$.01 = \left(\frac{1}{2}\right)^x$$

$$\log_{\frac{1}{2}} .01 = x$$

$$\frac{\log .01}{\log .5} = x = \frac{6.64 \times 100000}{664045}$$

6-77 cont'd c) Never, it reduces by $\frac{1}{2}$ each time so it will never all go away

6-78) $x > 0; y = |x+3|$
 $x \leq 0; y = x^3 + 3$

a) dashed line

b) $x > 0; y = |x+2|$
 $x < 0; y = (x+2)^3$

6-79) a) 2^4 b) 2^{-3} c) $2^{1/2}$ d) $2^{2/3}$

Friday 2/27 6:1.5 cont'd (6-80 \rightarrow 6-87)

6-80) $x + 2y - z = -1$ ①
 $2x - y + 3z = 13$ ②
 $x + y + 2z = 14$ ③

2×3 $2x - y + 3z = 13$
 $x + y + 2z = 14$

 $3x + 5z = 27$

1×2
 mult + ② by 2
 $x + 2y - z = -1$
 $4x - 2y + 6z = 26$

 $5x + 5z = 25$

$3x + 5z = 27$
 $-5x - 5z = -25$

 $-2x = 2$
 $x = -1$

$3(-1) + 5z = 27$
 $-3 + 5z = 27$
 $5z = 30$
 $\frac{5z}{5} = \frac{30}{5}$
 $z = 6$

$-1 + 2y - 6 = -1$ ①
 $2y - 7 = -1$
 $2y = 6$
 $y = 3$

$(-1, 3, 6)$

6-81) $(-1, 10)$
 $(0, 5)$
 $(2, 7)$

$$y = ax^2 + bx + c$$

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

$$5 = a(0)^2 + b(0) + c \quad 5 = c$$

$$7 = a(2)^2 + 2b + c \quad 7 = 4a + 2b + c$$

mult by 2
 $10 = a - b + 5$
 $5 = a - b$

$$\begin{array}{r} 4a + 2b = 2 \\ +2a - 2b = +10 \\ \hline 6a = 12 \\ \frac{6}{6} \quad \frac{6}{6} \\ a = 2 \end{array}$$

$$7 = 4a + 2b + 5$$

$$2 = 4a + 2b$$

$$5 = 2 + b$$

$$3 = b$$

$$-3 = b$$

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

6-82) a) $b^a = 24$ b) $(2y)^{3x} = 7$

c) $5x = \log_2 3y$ d) $\log_{20} 40 = 6$

6-83) $\frac{3x}{x^2+2x+1} + \frac{3}{x^2+2x+1} = \frac{3x+3}{(x+1)(x+1)} = \frac{3(x+1)}{(x+1)(x+1)}$

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

6-84) $y = 4x^2 - 24x + 7$

yes Hannah is correct $4(x-3)^2 - 29 = 4x^2 - 24x + 7$

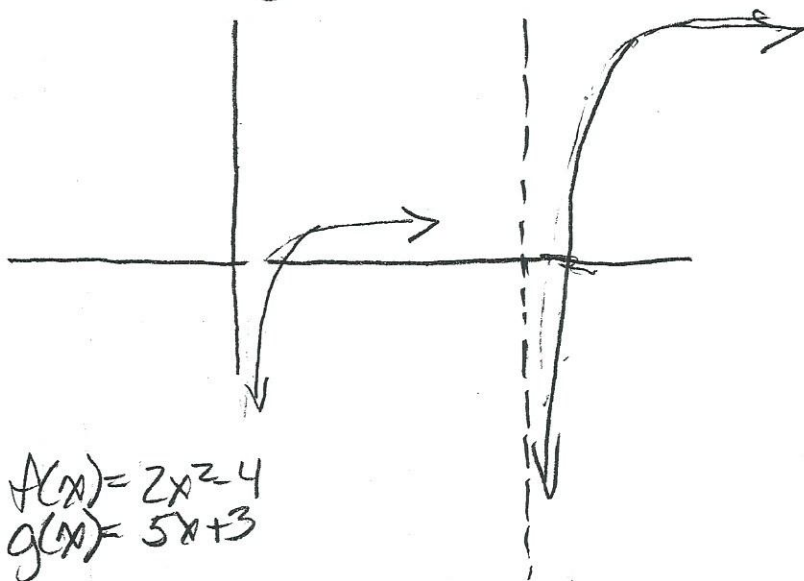
and $4(x-3)^2 - 2 = 4x^2 - 24x + 34$

6-85) a) $y = 2x^2 - 8x + 7$
 $y = 2(x^2 - 4x) + 7$
 $y = 2(x^2 - 4x + 4) + 7 - 8$
 $y = 2(x-2)^2 - 1$

Vertex $(2, -1)$
 axis of symm $x = 2$

b) $y = 5x^2 - 10x - 7$
 $y = 5(x^2 - 2x) - 7$
 $y = 5(x^2 - 2x + 1) - 7 - 5$
 $y = 5(x-1)^2 - 12$
 vertex $(1, -12)$
 axis of symm

$$6-86) \quad y = \log(x-6) + 3$$



$$6-87) \quad f(x) = 2x^2 - 4$$

$$g(x) = 5x + 3$$

$$a) \quad f(a) = 2a^2 - 4 \quad b) \quad f(3a) = 2(9a^2) - 4 = 18a^2 - 4$$

$$c) \quad f(a+b) = 2(a+b)^2 - 4 = 2a^2 + 4ab + 2b^2 - 4$$

$$d) \quad f(x+7) = 2(x+7)^2 - 4 = 2x^2 + 28x + 98 - 4$$

$$= 2x^2 + 28x + 94$$

$$e) \quad f(5x+3) = 2(5x+3)^2 - 4 = 50x^2 + 60x + 18 - 4$$

$$= 50x^2 + 60x + 14$$

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

$$= 10x^2 - 20 + 3 = 10x^2 - 17$$

Monday 3/2 6.2.1 (6-95 → 6-103)

6-95)

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

multiplier = 3

$$y = 3^x$$

6-96) $2 = 1.04^x$

$x = \log_{1.04} 2$ the variable is the exponent

$$56 = x^8$$

$8 = \log_x 56$ here the variable is the base so the log will not help

6-97) $\log_{10} x > 2$

x must be > 100
because $10^2 = 100$

6-98) $(1, 0)$ $y = \log_b x$

$0 < b < 1$
because neg values of y have x increasing so x must be a fraction

6-99) a) $8 \cdot \frac{1}{8} = 1$ b) $x \cdot \frac{1}{x} = 1$

c) $\sqrt[3]{m^8} = \sqrt[3]{40}$

$$m = 40^{1/3}$$
$$m = 1.58$$

d) $\sqrt[4]{n^6} = \sqrt[4]{300}$

$$n = 300^{1/4} = 2.587$$

e) $x^a = b$

$$x = b^{1/a}$$

6-100) $2^{1/2} = \sqrt{2}$ while $2^{-1} = \frac{1}{2}$

6-101) a) $|x| < 3$



$x < 3$ and $x > -3$

b) $|2x+1| < 3$

$2x+1 < 3$ and $2x+1 > -3$

$2x < 2$

$x < 1$

and $2x > -4$

$x > -2$



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

$2x+1 \geq 3$ or $2x+1 \leq -3$

$2x \geq 2$

$x \geq 1$

or

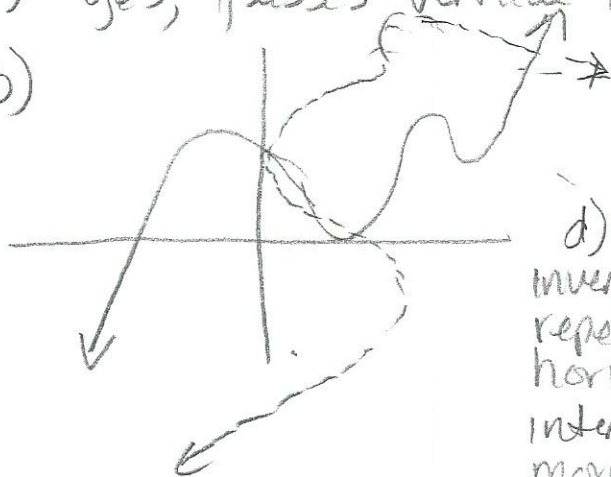
$2x \leq -4$

$x \leq -2$



6-102) a) yes, passes vertical line test

b)



c) Not Necessarily

d) Functions that have inverse functions have no repeated outputs; a horizontal line can intersect the graph in no more than one place

e) Yes, a sleeping parabola is not a function but its inverse is a function

$$\begin{aligned} 6-103) \quad a) \quad & -4x = z - 2y + 12 \\ & y + z = 12 - x \\ & 8x - 3y + 4z = 1 \end{aligned}$$

$$\begin{aligned} & -4x + 2y - z = 12 \quad (1) \\ & x + y + z = 12 \quad (2) \\ & 8x - 3y + 4z = 1 \quad (3) \end{aligned}$$

$$\begin{aligned} (1) \& (2) \quad & -4x + 2y - z = 12 \\ & x + y + z = 12 \\ \hline & (-3x + 3y - 2z = 24) \cdot 4 \end{aligned}$$

$$\begin{aligned} & -12x + 12y = 96 \\ & 12x - 21y = -141 \\ \hline & -9y = -45 \\ & y = 5 \end{aligned}$$

$$\begin{aligned} -3 + 5 + z &= 12 \\ z &= 10 \end{aligned}$$

$$\begin{aligned} (2) \& (3) \quad & -4x - 4y - 4z = -48 \\ & 8x - 3y + 4z = 1 \\ \hline & 3(4x - 7y = -47) \end{aligned}$$

$$\begin{aligned} -3x + 3(5) &= 24 \\ -3x &= 9 \\ x &= -3 \end{aligned}$$

$$z = 10 \quad \boxed{(-3, 5, 10)}$$

$$\begin{aligned} b) \quad & 3x + y - 2z = 6 \quad (1) \\ & x + 2y + z = 7 \quad (2) \\ & 6x + 2y - 4z = 12 \quad (3) \end{aligned}$$

$$\begin{aligned} (2) \& (3) \quad & -x - 2y - z = -7 \\ & 6x + 2y - 4z = 12 \\ \hline & 5x - 5z = 5 \end{aligned}$$

$$\begin{aligned} (1) \& (2) \quad & -6x - 2y + 4z = 12 \\ & x + 2y + z = 7 \\ \hline & -5x + 5z = -5 \end{aligned}$$

$$\begin{aligned} & 5x - 5z = 5 \\ & -5x + 5z = -5 \\ \hline & 0 = 0 \end{aligned}$$

Infinite # of solutions!

c) The planes intersect in a line

Tue/Wed 3/3 & 3/4 6.2.2 (6-113 \rightarrow 6-122)

$$6-113) \quad a) \quad (5.825)^{x-3} = 120$$

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

$$\frac{\log 120}{\log 5.825} = x-3$$

$$x-3 = 2.717$$

$$\frac{2.08}{1.7653} = x-3$$

$$\boxed{x = 5.717}$$

$$6-113) \quad b) \quad \frac{18(1.2)^{(2x-1)}}{18} = \frac{900}{18}$$

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

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

$$\frac{\log 50}{\log 1.2} = 2x-1$$

$$\frac{1.698}{0.07918} = 2x-1$$

$$2x-1 = 21.44$$

$$\frac{2x}{2} = \frac{22.44}{2}$$

$$\boxed{x = 11.228}$$

$$6-114) \quad a) \quad \frac{x}{1 - \frac{1}{x}} = \frac{x}{\frac{x-1}{x}} = \frac{x}{\frac{x-1}{x}} = x \div \frac{x-1}{x}$$

$$\frac{x}{1} \cdot \frac{x}{x-1} = \boxed{\frac{x^2}{x-1}}$$

$$b) \quad \frac{\frac{1}{a} + \frac{1}{b}}{\frac{1}{b} - \frac{1}{a}} = \frac{\frac{b}{ab} + \frac{a}{ab}}{\frac{1}{b} - \frac{a}{b}} = \frac{\frac{a+b}{ab}}{\frac{1-ab}{b}}$$

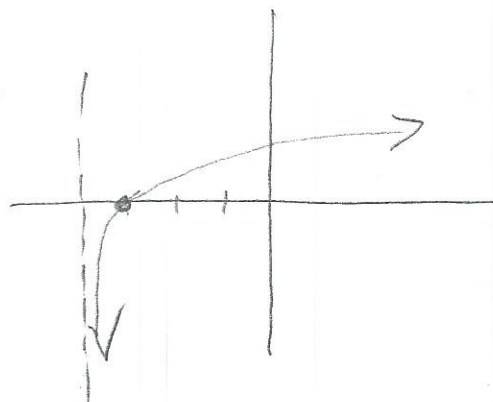
$$= \frac{a+b}{ab} \div \frac{1-ab}{b} = \frac{a+b}{ab} \cdot \frac{b}{1-ab} = \boxed{\frac{a+b}{a^2 - a^2b}}$$

$$6-115) \quad \log_2 7$$

$$\frac{\log_5 7}{\log_5 2}$$

$$6-116) \quad y = \log_3(x+4)$$

shifted 4
units to the
left



6-117) initial = 1,000,000

$$t(n) = 1,000,000 (.87)^n$$

$$100,000 = 1,000,000 (.87)^n$$

$$.1 = (.87)^n$$

$$\log_{.87} .1 = n$$

$$\frac{\log .1}{\log .87} = n = \frac{-1}{-.0605}$$

$$n = 16.5 \text{ months}$$

$$1 = 1,000,000 (.87)^n$$

$$.000001 = (.87)^n$$

$$n = \frac{\log .000001}{\log .87} = \frac{-6}{-.0605}$$

$$n = 99 \text{ months}$$

6-118)

$$y = 3x^2 - 15x - 5$$

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

$$\left(\frac{5}{2}\right)^2 = \frac{25}{4} = 6.25$$

$$y = 3(x - 2.5)(x - 2.5) - 5 - (6.25)(3) - 5$$

$$y = 3(x - 2.5)^2 - 5 - 18.75$$

$$y = 3(x - 2.5)^2 - 23.75$$

$$V = (2.5, -23.75)$$

axis of symmetry $x = 2.5$

yes they are correct

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

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

$$\left(\frac{3}{2}\right)^2 = \frac{9}{4}$$

$$= 4(x - 1.5)(x - 1.5) + 6 - 4(2.25)$$

$$4(x - 1.5)^2 + 6 - 9$$

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

$$V(1.5, -3)$$

axis of symm $x = 1.5$

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

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

$$2(x + 3.5)^2 + 4 - 2\left(\frac{49}{4}\right)$$

$$2(x + 3.5)^2 + 4 - 24.5$$

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

$$V(-3.5, -20.5)$$

axis of symmetry $x = -3.5$

$$6-120) \quad y = 3(x+2)^2 - 7 \quad \vee \quad (-2, -7)$$

a) either $x \geq -2$ or $x \leq -2$

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

$$\sqrt{\frac{x+7}{3}} = y+2$$

$$x+7 = 3(y+2)^2$$

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

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

or

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

c) domain $x \geq -7$ for positive function
range $y \geq -2$

domain $x \geq -7$ for negative function
range $y \leq -2$

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

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

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

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

6-122) a) $t(n) = 4(5^n)$

$n=1, 20$ $n=3, 500$
 $n=2, 100$

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

$78125 = 5^n$
 $\log_5 78125 = n$

a) $64n = 4(5^6) = 62,500$
 $74n = 312,500$

$\frac{\log 78125}{\log 5} = \boxed{7}$

94,500 is between and there are no even integers between 6 & 7