HW-ALG 2 5-96 → 5-104

5-96) a) 12 because $12^{1.92642409} = 10$

b) maybe 12 since humans have 10 and our log base is 10

5-97) a) $\log_x(25) = 1$ $\boxed{x = 25}$

b) $x = \log_3 9 = 3^x = 9$ $\boxed{x = 2}$

c) $3 = \log_7(x)$ $7^3 = x = \boxed{343}$

d) $\log_3(x) = \frac{1}{2}$ $3^{1/2} = x = \boxed{\sqrt{3}}$

e) $3 = \log_x(27)$ $x^3 = 27$ $\boxed{x = 3}$

f) $\log_{10}(10{,}000) = x$ $10^x = 10{,}000 \Rightarrow \boxed{x = 4}$

5-98) Less than 1 $0.1 < 0.3 < 1$

$\log(0.1) = -1$ and $\log 1 = 0$

5-99) $1.04^x = 2$ use guess & check

$x \approx 17.673$

5-100) a) $4x^2 - 1$
$(2x-1)(2x+1)$

b) $4x^2 + 4x + 1$
$(2x+1)(2x+1) = (2x+1)^2$

c) $2y^2 + 5y + 2$ $AC = 4$

4 and 1 (5)

$2y^2 + 4y + 1y + 2$
$2y(y+2) + 1(y+2)$
$(2y+1)(y+2)$

d) $3m^2 - 5m - 2$
$AC = -6$
-6 and $+1$ (-5)

$3m^2 - 6m + 1m - 2$
$3m(m-2) + 1(m-2)$
$(3m+1)(m-2)$

5-101) a) $x^2 - 2x < 3$

$x^2 - 2x - 3 < 0$

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

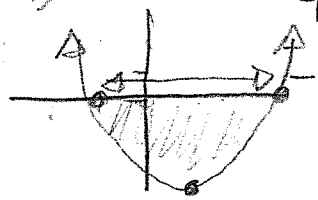
Switch sign

$x - 3 < 0$ $\quad x + 1 < 0$

$x < 3$ $\quad x > -1$

think about the intercepts

$-1 < x < 3$



vertex form

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

$(x-1)^2 - 2$

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

$0 \leq x^2 - 3x + 2$

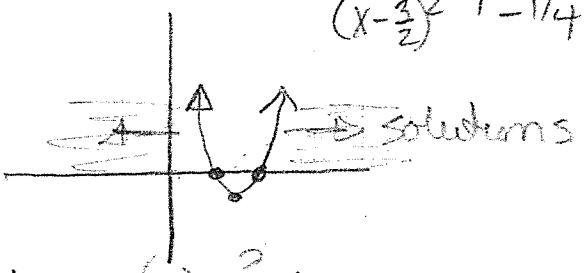
$0 \leq (x-2)(x-1)$

$x \leq 1$

$x \geq 2$

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

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



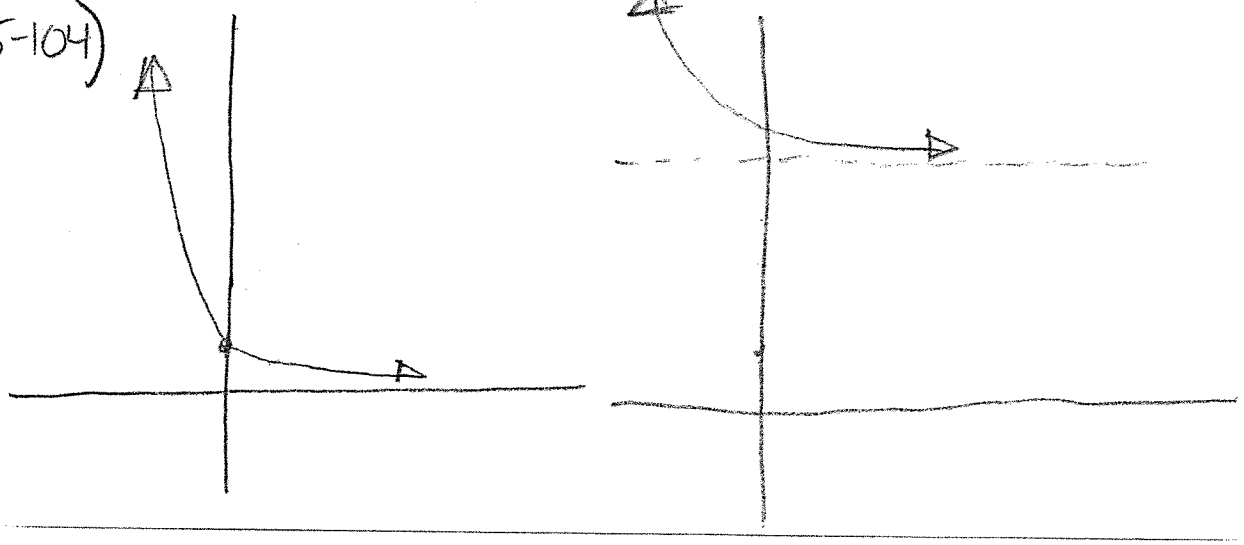
5-102) $\log_3(2) \stackrel{?}{=} \log_2(3)$

$3^x = 2 \neq 2^x = 3$

5-103) a) $\frac{y}{b^x} = \frac{ab^x}{b^x} \Rightarrow a = \frac{y}{b^x}$

b) $\frac{y}{a} = \frac{ab^x}{a}$ $\quad \sqrt[x]{b^x} = \sqrt[x]{\frac{y}{a}}$ $\quad b = \sqrt[x]{\frac{y}{a}}$

5-104)



Fri 2/6 5.2.5 (5-112, 114, 118, 119, 120, 124, 125)

5-112) $f(x) = \sqrt{7-x} - 6$

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

$f(g(x)) = \sqrt{7-(-(x+6)^2+7)} - 6 = \sqrt{7+(x+6)^2-7} - 6$

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

$g(f(x)) = -(\sqrt{7-x}+6)^2 + 7$

$= -(\sqrt{7-x})^2 + 7 = -(7-x)+7 = \boxed{x}$

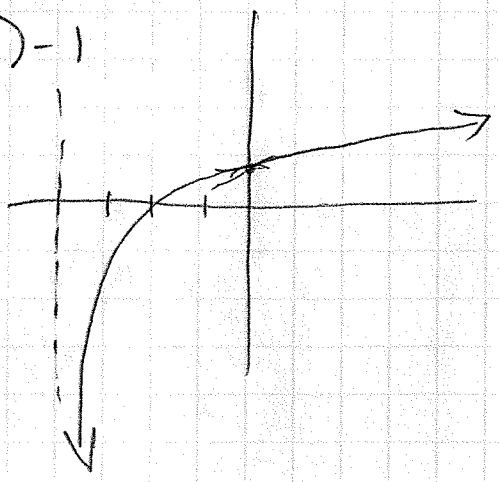
$f(g(x)) = g(f(x))$ They are inverses

5-114) $2^x = 3$ $\quad x \approx 1.585$

$\log_2 3 = x$ $\quad \frac{\log_{10} 3}{\log_2} = 1.585$

5-118) $y = 3\log_8(x+4) - 1$

$x = 0 \quad y = .8$



5-119) $x + y = -3$

$2x - y = -6$

$3x - 2y + 5z = 16$

$\Rightarrow$ $x + y = -3$

$2x - y = -6$

$3x = -9$

$\frac{3}{3} \quad \frac{3}{3}$

$x = -3$

$-3 + y = -3$

$y = 0$

$(-3, 0, 5)$

$3(-3) - 2(0) + 5z = 16$

$-9 + 5z = 16$

$5z = 25$

$z = 5$

5-120) $m^5 = 50$ $\log_m 50 = 5$

$m = \sqrt[5]{50} = 50^{1/5}$

$m \approx 2.19$

5-124) a) $\frac{3}{(x-4)(x+1)} + \frac{6}{(x+1)} \cdot \frac{(x-4)}{(x-4)} = \frac{3+6x-24}{(x-4)(x+1)}$

$\boxed{\frac{6x-21}{(x-4)(x+1)}}$

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

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

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

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

5-125) a) $ab\left(\frac{1}{a} + \frac{1}{b}\right) = \frac{ab}{a} + \frac{ab}{b} = \boxed{b+a}$

b) $cd\left(\frac{3}{c} + \frac{2c}{d}\right) = \frac{3cd}{c} + \frac{2c^2d}{d} = \boxed{3d + 2c^2}$

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

d) $\square\left(\frac{5}{x} + \frac{8}{y}\right) = 5y + 8x$ multiply by $\boxed{xy}$

$\frac{5xy}{x} + \frac{8xy}{y} = 5y + 8x$ ✓