MAT 121-G81 Test 2 – Fall, 2013 Name_______________

100 Points Covers Chapter 2 NO GRAPHING CALCULATORS!!!

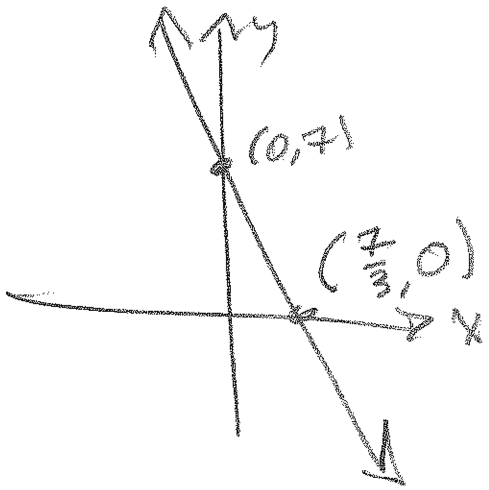
$(x_1, y_1) \quad (x_2, y_2)$

1. (10 pts) Find an equation of the line through the points (2, 1) and (4, -5).

$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-5-1}{4-2} = \frac{-6}{2} = -3$ $\quad \boxed{y = -3(x-2)+1}$

$y = m(x - x_1) + y_1 \quad = -3x + 6 + 1 = -3x + 7$

2. (5 pts) Sketch the graph of the line whose equation you found in #1, above. Show *x*-and *y*-intercepts.



$y = -3x + 7 \stackrel{\text{set}}{=} 0$

$-3x = -7$

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

3. (5 pts) Is the linear function in #s 1 and 2 increasing or decreasing?

Decreasing

4. Suppose *y* varies jointly as the cube of *x* and the square root of *z* and inversely as the square of *w*.

a. (5 pts) Write an equation representing the relationship.

$y = K \frac{x^3 \sqrt{z}}{w^2}$

$\to 2 \quad \to 9$

b. (5 pts) Suppose $y = 24$ when $x = 4$, $z = 2$ and $w = 4$. What, then, is *y* when $x = 2$, $z = 3$ and $w = 4$?

$y = \frac{2^3 \sqrt{9}}{4^2} K$ $\quad y = 16\left(\frac{2^3\sqrt{3}}{4^2}\right) = \cancel{16}\left(\frac{8\sqrt{3}}{\cancel{16}}\right)$

$= \frac{24}{16} K = \frac{3}{2} K$ $\quad = 8\sqrt{3}$

$\frac{3}{2} K = 24 \Rightarrow K = \frac{48}{3} = 16$

5. (5 pts each) Compute the discriminant for each of the following quadratic and tell me the nature of solutions, specifically, how many distinct solutions there are and whether they're real or non-real. *Do not solve the equations.*

a. $2x^2 - 5x + 18 = 0$

$b^2 - 4ac$
$= (-5)^2 - 4(2)(18)$
$\boxed{= -119}$

2 nonreal

b. $75x^2 - 35x - 6 = 0$

$b^2 - 4ac =$
$(-35)^2 - 4(75)(-6)$
$\boxed{= 3025}$

2 real Also
$\sqrt{3025} = 55 \rightarrow$ RATIONAL

c. $9x^2 - 24x + 16 = 0$

$b^2 - 4ac = (-24)^2 - 4(9)(16)$
$\boxed{= 0}$

One real

6. Solve by any method, but *show all work*!!!

a. (5 pts) $75x^2 - 35x - 6 = 0$

$x = \dfrac{35 \pm 55}{2(75)} = \dfrac{5(7 \pm 11)}{2(3)(5)(5)}$

$= \dfrac{7 \pm 11}{30}$ → $\dfrac{18}{30} = \dfrac{3}{5}$, $-\dfrac{4}{30} = -\dfrac{2}{15}$

$\left\{ \dfrac{3}{5}, -\dfrac{2}{15} \right\}$

b. (5 pts) $x^2 - 5x + 7 = 0$

$x^2 - 5x = -7$

$x^2 - 5x + \left(\frac{5}{2}\right)^2 = -7 + \frac{25}{4} = \frac{-28 + 25}{4}$

$\left(x - \frac{5}{2}\right)^2 = -\frac{3}{4}$

$x - \frac{5}{2} = \pm i\sqrt{\frac{3}{4}} = \pm \frac{i\sqrt{3}}{2}$

$\boxed{x = \dfrac{5 \pm i\sqrt{3}}{2}}$

7. (5 pts) Solve $x^2 - 8x - 12 = 0$ by completing the square.

$x^2 - 8x = 12$

$x^2 - 8x + 4^2 = 12 + 16$

$(x-4)^2 = 28 = 4 \cdot 7$

$x - 4 = \pm\sqrt{4 \cdot 7} = \pm 2\sqrt{7}$

$\boxed{x = 4 \pm 2\sqrt{7}}$

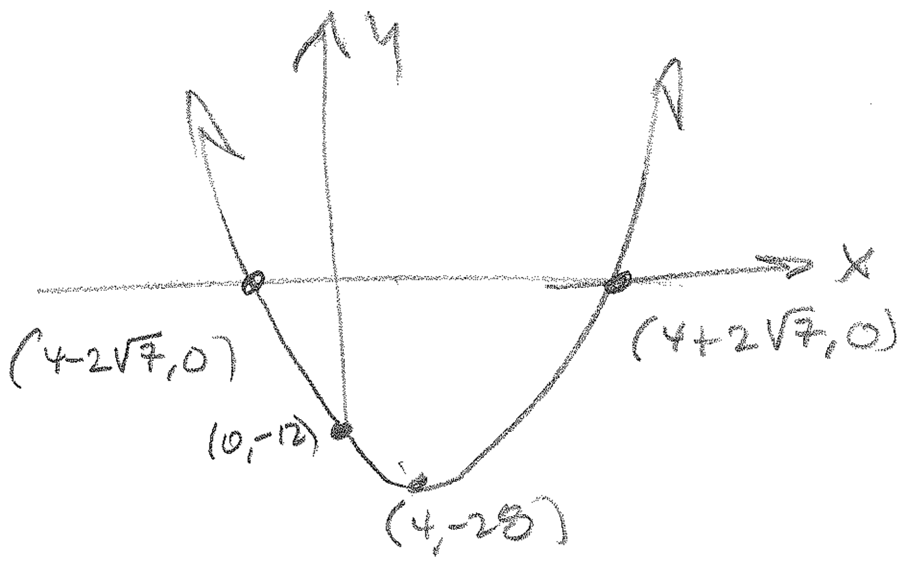
8. (10 pts) Complete the square for $f(x) = x^2 - 8x - 12$, and re-write it in the form $f(x) = a(x-h)^2 + k$. This is very similar to what you just did in #7, <u>but you're manipulating an expression, rather than solving an equation</u>, here. Use your work to sketch a graph of $f(x)$ that includes vertex, x- and y-intercepts, labeled as ordered pairs. I refuse to count tickmarks on the x- or y-axis.

$x^2 - 8x - 12$

$= x^2 - 8x + 4^2 - 4^2 - 12$

$= (x-4)^2 - 16 - 12$

$= (x-4)^2 - 28$



9. (5 pts) Based on your work on #8, state the domain and range of $f(x)$.

~~$\mathcal{D} = [-28,\infty)$~~ $= \text{Range} = \mathcal{R}$

~~$\mathcal{R} =$~~ $\mathcal{D} = (-\infty,\infty) = \mathbb{R}$

10. (5 pts) State intervals of increase and decrease for $f(x)$ from #s 8 and 9

Inc: $[4,\infty)$ Dec: $(-\infty,4]$

11. (10 pts) Solve the inequality $x^2 + 10x - 11 \le 11x - 5$.

$x^2 - x - 6 \le 0$

$(x-3)(x+2) \le 0$

$+ \quad - \quad +$

N -2 Y 3 N

$x \in [-2, 3]$

12. (5 pts) Solve $|3x-2| \le 11$. Give your answer in set-builder *and* interval notation.

$3x - 2 \le 11$ and $3x - 2 \ge -11$

$3x \le 13$ and $3x \ge -9$

$\{x \mid x \le \frac{13}{3}$ and $x \ge -3\} = [-3, \frac{13}{3}]$

13. (5 pts) Solve $|3x-2| > 11$. Give your answer in set-builder *and* interval notation.

$3x - 2 > 11$ OR $3x - 2 < -11$

$3x > 13$ OR $3x < -9$

$\{x \mid x > \frac{13}{3}$ OR $x < -3\}$

$= (-\infty, -3) \cup (\frac{13}{3}, \infty)$