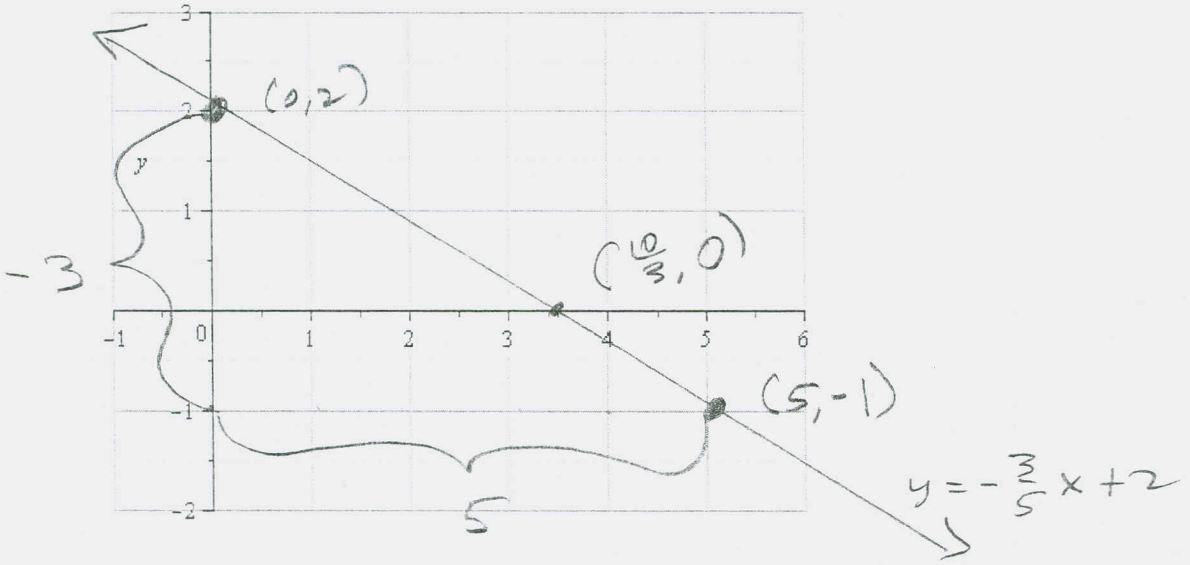
MAT 121-G81, Spring, 2012 Test 2
100 Points Name KEY

1. Let $f(x) = -\frac{3}{5}x + 2$ in the following:

a. (4 pts) Determine the slope and y-intercept of f.

$m = -\frac{3}{5}$, $(0, b) = 2$

b. (4 pts) Use the slope and y-intercept to graph f here:



c. (4 pts) Find the x-intercept of f.

$-\frac{3}{5}x + 2 = 0$

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

$= \frac{10}{3} \rightsquigarrow (\frac{10}{3}, 0)$

d. (4 pts) Is f increasing, decreasing or constant?

Decreasing

2. Compute the discriminant for the following quadratic functions. Find how many zeroes does h have, and whether they are real, nonreal, one of each, or what have you.

a. (4 pts) $h(x) = 5x^2 - 3x + 2$ $a = 5, b = -3, c = 2$

$b^2 - 4ac = (-3)^2 - 4(5)(2) = 9 - 40 = -36$ Two, nonreal zeros

b. (4 pts) $h(x) = 3x^2 - 5x + 2$ $a = 3, b = -5, c = 2$

$b^2 - 4ac = (-5)^2 - 4(3)(2) = 25 - 24 = 1$ Two real zeros

3. Let $f(x) = 6x^2 - 13x + 6$.

$(6)(6) = (3)(2)(3)(2)$

FACTORS WHOSE SUM IS -13:

$(-9)(-4) = 36$

$-9 - 4 = -13$ ✓

a. (4 pts) Find the zeros of f by factoring.

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

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

$= (2x-3)(3x-2) \stackrel{SET}{=} 0 \Rightarrow$

$2x-3=0$ OR $3x-2=0$

$x = \frac{3}{2}$ OR $x = \frac{2}{3}$

$x \in \{\frac{2}{3}, \frac{3}{2}\}$

b. (4 pts) Find the zeros of f by quadratic formula.

$a=6, b=-13, c=6$

$2 \overline{)24}$
6
144

$b^2 - 4ac = (-13)^2 - 4(6)(6)$

$= 169 - 144$

$= 25$

$x = \frac{-b \pm \sqrt{b^2-4ac}}{2a}$

$= \frac{13 \pm \sqrt{25}}{2(6)} = \frac{13 \pm 5}{12}$

$\frac{18}{12} = \frac{3}{2}$

$\frac{8}{12} = \frac{2}{3}$

$x \in \{\frac{2}{3}, \frac{3}{2}\}$

c. (4 pts) Find the zeros of $f(x) = x^2 + 6x - 5$ by completing the square.

$x^2 + 6x = 5$

$x^2 + 6x + 3^2 = 5 + 9$

$(x+3)^2 = 14$

$x + 3 = \pm\sqrt{14}$

$x = -3 \pm \sqrt{14}$

$x \in \{-3 \pm \sqrt{14}\}$

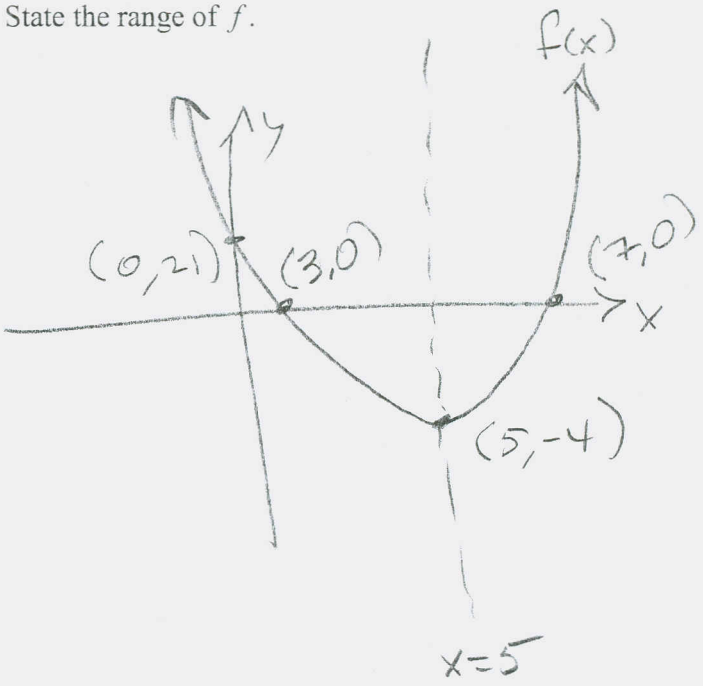
4. (20 pts) Complete the square for $f(x) = x^2 - 10x + 21$, and re-write it in the form $a(x-h)^2 + k$. Sketch its graph, based on your work. Label the vertex, axis of symmetry, and x- and y-intercepts on your graph. State the range of f.

$f(x) = x^2 - 10x + 21$

$= x^2 - 10x + 5^2 - 25 + 21$

$= (x-5)^2 - 4$

↑ RIGHT 5 ↑ DOWN 4



$f(x) = 0 \Rightarrow$

$(x-5)^2 - 4 = 0$

$(x-5)^2 = 4$

$x - 5 = \pm 2$

$x = 5 \pm 2$ → 7, 3

5. (10 pts) Find the complex zeros of $f(x) = 4x^2 - 12x + 10$. Leave your answer in simplified radical form (no calculator stuff). **(5 bonus points if you solve it by completing the square)**

$4x^2 - 12x + 10 = 0$

$x^2 - 3x + \frac{10}{4} = 0$

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

$x^2 - 3x + \left(\frac{3}{2}\right)^2 = -\frac{5}{2} + \frac{9}{4}$

$\left(x - \frac{3}{2}\right)^2 = \frac{-10+9}{4} = -\frac{1}{4}$

$x - \frac{3}{2} = \pm\sqrt{-\frac{1}{4}} = \pm i\frac{\sqrt{1}}{\sqrt{4}} = \pm\frac{1}{2}i$

$x = \frac{3}{2} \pm \frac{1}{2}i$ $\qquad x \in \left\{\frac{3 \pm 1i}{2}\right\}$

6. (10 pts) Solve $6x^2 + 13x \geq 6$. Express your answer in both set-builder and interval notation. You've already done about half the work on this one, in #3, on page 2.

$6x^2 + 13x - 6 = 0$

$a = 6, b = 13, c = -6$

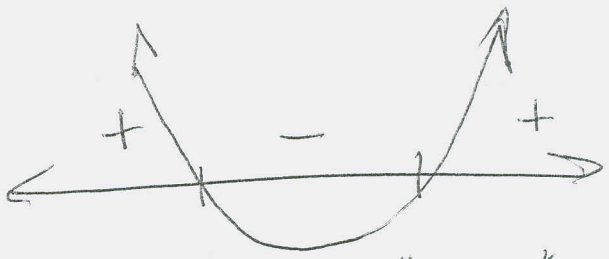
$b^2 - 4ac = (13)^2 - 4(6)(-6)$

$= 313$

$x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$

$= \dfrac{-13 \pm \sqrt{313}}{12}$

DANG!



Want + for "≥ 0"

Include endpts for "$\geq$"

$+6x^2$ + smaller, opens up

$\left(-\infty, \dfrac{-13-\sqrt{313}}{12}\right] \cup \left[\dfrac{-13+\sqrt{313}}{12}, \infty\right)$

Solve the absolute value equations and inequalities. (4 pts each). Same work for 7 – 9. Just interpret the results, differently.

7. $|3x - 5| = 2$

$3x - 5 = 2$ OR $3x - 5 = -2$

$3x = 7$ OR $3x = 3$

$\{x \mid x = \frac{7}{3}$ OR $x = 1\}$

$= \{1, \frac{7}{3}\}$

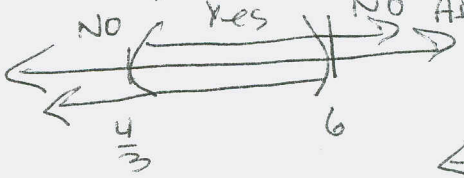
8. $|3x - 11| < 7$

$3x - 11 < 7$ and $3x - 11 > -7$

$3x < 18$ and $3x > 4$

$\{x \mid x < 6$ and $x > \frac{4}{3}\}$

$= (\frac{4}{3}, 6)$



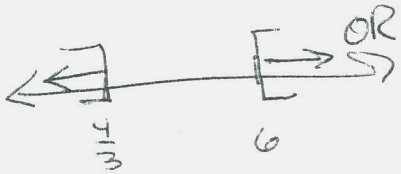
9. $|3x - 11| \geq 7$

$3x - 11 \geq 7$ OR $3x - 11 \leq -7$

$3x \geq 18$ OR $3x \leq 4$

$\{x \mid x \geq 6$ OR $x \leq \frac{4}{3}\}$

AND $(-\infty, \frac{4}{3}] \cup [6, \infty)$



10. $|3x - 11| \geq -7$

$(-\infty, \infty)$

11. $|3x - 11| \leq -7$

$\emptyset$

12. $|3x - 11| = -7$

$\emptyset$