MAT 121-G81-G82 Test 2 – Fall, 2014 Name KEY
100 Points Covers Chapter 2 NO GRAPHING CALCULATORS!!!

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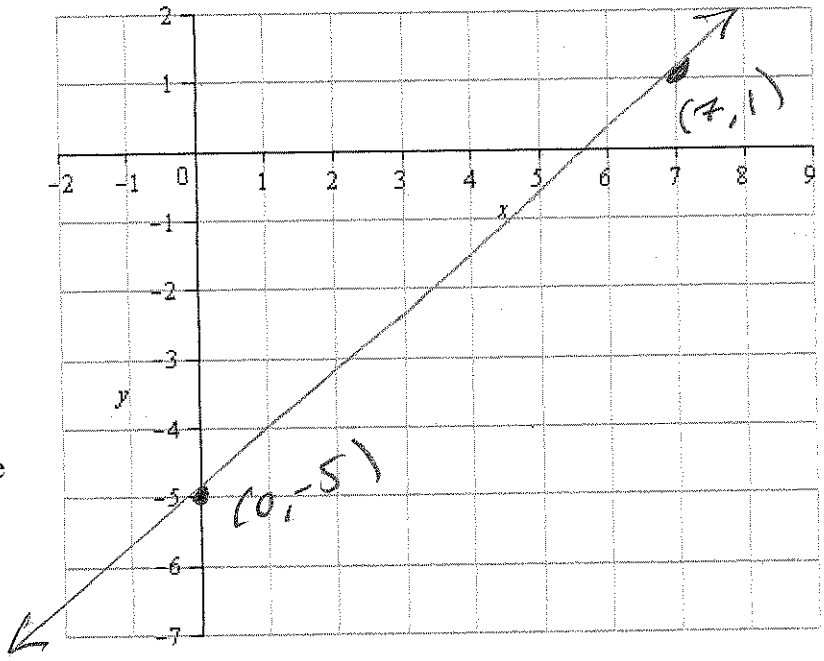
1. Let $f(x)=\frac{6}{7}x-5$

a. (5 pts) Determine the slope and y-intercept of f.

$m=\frac{6}{7}$, $(0,b)=(0,-5)$

b. (5 pts) Use the slope and y-intercept to graph f, in the space on the right:



c. (5 pts) What's the average rate of change of f?

$m=\frac{6}{7}$

2. Suppose y varies jointly as x and the square of z and inversely as the cube of w.

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

$y=\frac{k\times z^2}{w^3}$

$\frac{256}{64}=\frac{128}{32}=\frac{64}{16}=\frac{32}{8}=\frac{16}{4}=4$

b. (5 pts) Suppose $y=24$ when $x=2$, $z=9$ and $w=4$. What, then, is y when $x=2$, $z=3$ and $w=4$?

$24=\frac{k(2)(9)^2}{4^3}$

$\frac{(24)(64)}{(2)(81)}=k=\frac{256}{27}$

$y=\frac{256}{27}\left(\frac{(2)(3)^2}{4^3}\right)=\frac{4(2)}{3}=\frac{8}{3}$

3. (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. $3x^2-12x+9=0$

$a=3, b=-12, c=9$

$b^2-4ac=(-12)^2-4(3)(9)=144-108=36$. Two, distinct, rational

b. $-5x^2-110x-703=0$

$a=-5, b=-110, c=-603$

$b^2-4ac=(-110)^2-4(-5)(-703)=-960$

Two non real sol'ns

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

a. (10 pts) $84x^2 - 8x - 105 = 0$

$a=84,\ b=-8,\ c=-105$

$b^2-4ac = (-8)^2 - 4(84)(-105) = 35344$

$\sqrt{b^2-4ac} = 188$

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

$= \dfrac{8 \pm 188}{2(84)} = \dfrac{4(2 \pm 47)}{2(84)} = \dfrac{2 \pm 47}{42}$

$\dfrac{49}{42} = \dfrac{7}{6}$

$\dfrac{-45}{42} = -\dfrac{15}{14}$

$x \in \left\{-\dfrac{15}{14}, \dfrac{7}{6}\right\}$

Just hit 35344 with $\sqrt{\ }$, first thing

2 | 35344
2 | 17672
2 | 8836
2 | 4418
47 | 2209
47

ouch! tough to get w/o tech.

2 | 188
2 | 94
47

5. (5 pts) Solve $x^2 + 6x + 11 = 0$ by completing the square.

$x^2+6x = -11$

$x^2+6x+3^2 = -11+9$

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

$x+3 = \pm i\sqrt{2}$

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

$\dfrac{-25}{12} - \dfrac{120}{12} = \dfrac{-145}{12}$

6. Complete the square and re-write each of the following in the form $f(x) = a(x-h)^2 + k$.

a. (5 pts) $f(x) = x^2 + 6x + 11$

$= x^2+6x+3^2-9+11$

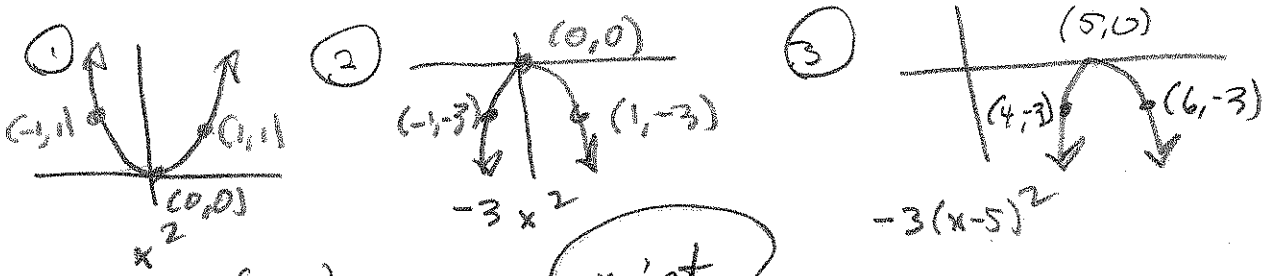
$= (x+3)^2 + 2$

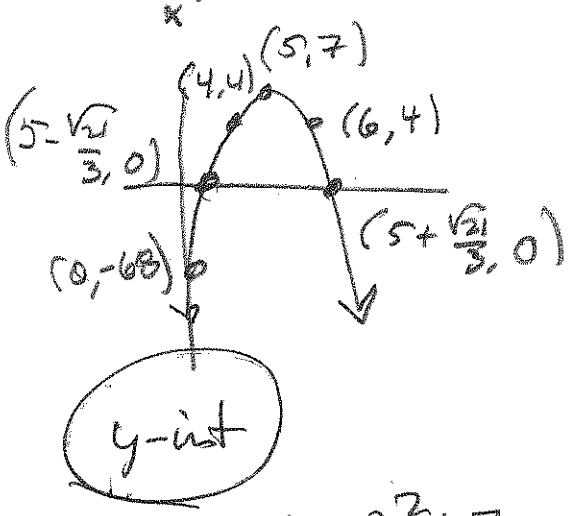
b. (5 pts) $f(x) = 3x^2 - 5x - 10$

$= 3\left(x^2 - \dfrac{5}{3}x + \left(\dfrac{5}{6}\right)^2\right) - 3\left(\dfrac{25}{36}\right) - 10$

$= 3\left(x - \dfrac{5}{6}\right)^2 - \dfrac{145}{12}$

7. a. (10 pts) Sketch the graph of $f(x)=-3(x-5)^2+7$. I want to see it step-by-step, using techniques I gave you. Your first graph of the basic function should include the points $(-1,1),(0,0)$, and $(1,1)$. Track where those points end up at each stage (each graph), as demonstrated in videos.





x-int

$-3(x-5)^2=-7$

$(x-5)^2=\frac{7}{3}$

$x-5=\pm\sqrt{\frac{7}{3}}=\pm\frac{\sqrt{7}}{\sqrt{3}}=\pm\frac{\sqrt{21}}{3}$

$x=5\pm\frac{\sqrt{21}}{3}$ OR $\frac{15\pm\sqrt{21}}{3}$

$-3(0-5)^2+7$ ← use pencil, Steve!

$=-3(-5)^2+7=-75+27=-68$

$=-3(25)+7$

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

$D=\mathbb{R}$, $R=(-\infty,7]$

9. ~~(5 pts)~~ State intervals of increase and decrease for $f(x)$. Took it out.

Inc: $(5,\infty)$

Dec: $(-\infty,5)$

10. (5 pts) Find the x- and y-intercepts for $f(x)$. Indicate and label these points on the graph, above.

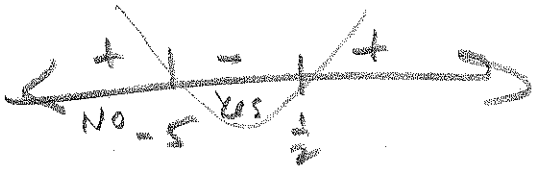
Decimal approximation: 1-point deduction. Simplified Radical Form for full credit.

11. (10 pts) Solve the inequality $x^2+14x-9 \le -x^2+5x-4$. Give your final answer in set notation and interval notation.

$2x^2+9x-5 \le 0$

$(2x-1)(x+5)=0$

$x=\frac{1}{2}, -5$



Want $-$

$x \in \left[-5, \frac{1}{2}\right]$

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

$2\left(x^2+\frac{9}{2}x+\left(\frac{9}{4}\right)^2\right)=5+2\left(\frac{81}{16}\right)$

$2\left(x+\frac{9}{4}\right)^2=5+2\left(\frac{81}{16}\right)$

$\left(x+\frac{9}{4}\right)^2=\frac{5}{2}+\frac{81}{16}$

$x+\frac{9}{4}=\pm\sqrt{\frac{121}{16}}=\pm\frac{11}{4}$

$x=\frac{-9\pm 11}{4} \Rightarrow \frac{1}{2}, -5$

Bonus (5 pts) Solve $x^2-5x+4>3-x$. Give an *exact* final answer (simplified radical form), in set notation and interval notation.

$x^2-4x+1>0$

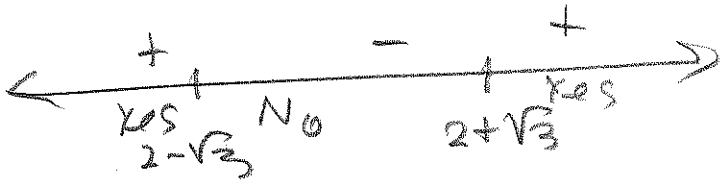
$x^2-4x+2^2-2^2+1=0$

$(x-2)^2-3=0$

$(x-2)^2=3$

$x-2=\pm\sqrt{3}$

$x=2\pm\sqrt{3}$



$x \in (-\infty, 2-\sqrt{3}) \cup (2+\sqrt{3}, \infty)$

12. Solve The absolute value inequalities. Give your answers in set-builder *and* interval notation.

a. (5 pts) $|4x+7| \ge 1$

$4x+7 \ge 1$ OR $4x+7 \le -1$

$4x \ge -6$ OR $4x \le -8$

$\{x \mid x \ge -\frac{3}{2}$ OR $x \le -2\}$

$= (-\infty, -2] \cup [-\frac{3}{2}, \infty)$

b. (5 pts) $|4x-7|<1$

$4x-7<1$ and $4x-7>-1$

$4x<8$ and $4x>6$

$\{x \mid x<2$ and $x>\frac{3}{2}\}$

$= (\frac{3}{2}, 2)$