MAT 099-G14 Test 3 Name KEY

100 Points Covers Chapter 3 NO GRAPHING CALCULATORS!!!

Do your own work. SHOW your work. When in doubt about how stupid I am, assume the worst.

1. (10 pts) Find the slope of the line between the points $(2,3)$ and $(4,-7)$.

$$\frac{-7-3}{4-2} = \frac{-10}{2} = -5 = m$$

2. (5 pts) Find an equation of the line with slope $m = \frac{3}{5}$, and y-intercept $(0,3)$.

$$y = \frac{3}{5}x + 3$$

3. (5 pts) Find an equation of the line with slope $m = \frac{3}{5}$ that contains the point $(4,-7)$.

$$y = \frac{3}{5}(x-4) - 7$$

$$= \frac{3}{5}x - \frac{12}{5} - \frac{35}{5}$$

4. (5 pts) Find the slope-intercept form of the line you obtained in #3.

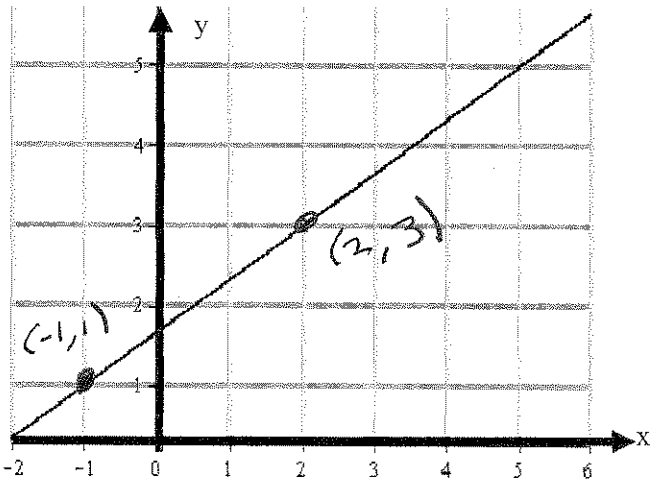
$$y = \frac{3}{5}x - \frac{47}{5}$$

$$5y = 3x - 47$$

5. (5 pts) Find the standard form of the line you obtained in #3. Your work from #4 should have you partway home on this one.

$$-3x + 5y = -47$$

6. (10 pts) Find an equation of the line whose graph is shown. (Hint: Pick your points in such a way as to make the arithmetic easier.)



$m = \frac{3-1}{2+1} = \frac{2}{3}$

$y = \frac{2}{3}(x+1)+1$

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

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

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

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

7. (10 pts) What is the slope of a line that is…

a. … parallel to the line $7x-3y=11$?

$-3y = -7x + 11$

$y = \frac{7}{3}x - \frac{11}{3}$

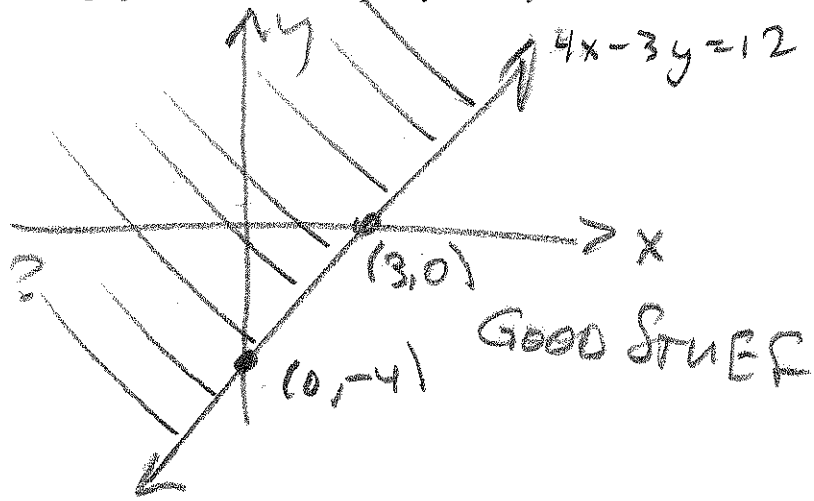
$m = \frac{7}{3}$

b. … perpendicular to the line $7x-3y=11$? (Basing your answer on part a is just fine.)

$m_\perp = -\frac{3}{7}$

8. (10 pts) Sketch the graph of the linear inequality $4x-3y \geq 12$.

x	y
0	-4
3	0



$0 \geq 12$?

No

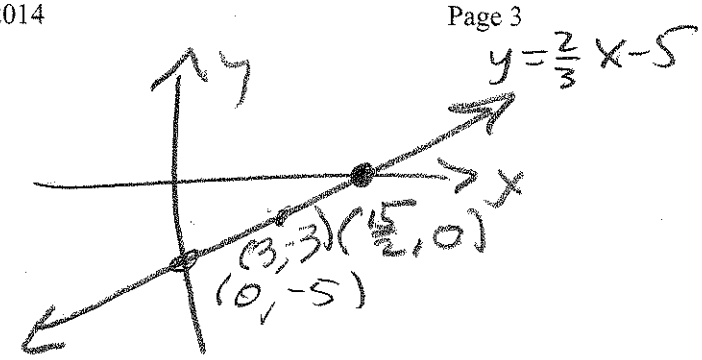
GOOD START

9. (5 pts) Sketch the graph of the line $y = \frac{2}{3}x - 5$.

$(0, -5)$

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

$x = \frac{15}{2} \rightsquigarrow \left(\frac{15}{2}, 0\right)$



10. (20 pts) Let $f(x) = x^2 - 3x + 2$ and $g(x) = 2x - 7$. Find and simplify the following:

a. $f + g = x^2 - 3x + 2 + 2x - 7 = \boxed{x^2 - x - 5}$

b. $fg = (x^2 - 3x + 2)(2x - 7) = 2x^3 - 7x^2 - 6x^2 + 21x + 4x - 14$

$= \boxed{2x^3 - 13x^2 + 25x - 14}$

c. $\frac{f}{g} = \boxed{\frac{x^2 - 3x + 2}{2x - 7}}$

d. $f \circ g$

$= (2x-7)^2 - 3(2x-7) + 2 = 4x^2 - 28x + 49 - 6x + 21 + 2$

$= \boxed{4x^2 - 34x + 72}$

11. (5 pts) Let $f(x) = x^2 - 3x + 2$. Simplify the difference quotient $\frac{f(x+h) - f(x)}{h}$.

$$\frac{(x+h)^2 - 3(x+h) + 2 - (x^2 - 3x + 2)}{h} = \frac{x^2 + 2xh + h^2 - 3x - 3h + 2 - x^2 + 3x - 2}{h}$$

$$= \frac{2xh + h^2 - 3h}{h} = \frac{h(2x + h - 3)}{h} = \boxed{2x + h - 3}$$

12. (10 pts) Suppose y varies jointly with x and w and inversely with the square of z. If $y = 10$, when $x = 4$, $w = 5$ and $z = 2$, please come up with an equation relating y to x, w, and z. Then use that equation to tell me what y is when $x = 7$, $w = 3$ and $z = 4$.

$y = \frac{kxw}{z^2}$

$10 = \frac{4(5)}{2^2}k$

$10 = 5k$

$2 = k$

$y\Big|_{\substack{x=7\\w=3\\z=4}} = \frac{2(7)(3)}{4^2} = \boxed{\frac{21}{8}}$

Bonus #7:

$b^2-4ac = (-20)^2 - 4(4)(17) = 288$

$= 2 \cdot 144 = 2 \cdot 12^2$

$x = \frac{20 \pm 12\sqrt{2}}{8} = \frac{5 \pm 3\sqrt{2}}{2}$;

Answer up to 2 bonus questions for up to 15 points. I will grade the first 2 you do work on, unless you tell me to omit them.

1. (5 pts) Consider the equation $ax^2 + bx + c = 0$. Write the discriminant.
2. (5 pts) What's the solution of the equation $ax^2 + bx + c = 0$?
3. (5 pts) Solve the inequality $|2x - 3| \geq 3$
4. (5 pts) Factor $420x^2 - 332x - 1155$ into the product of two binomials.
5. (5 pts) Factor $375x^3 - 24y^9$
6. (5 pts) Use Pascal's triangle to expand $(2x - y)^5$
7. (5 pts) Factor $4x^2 - 20x + 17$ (It doesn't factor over the rationals! Your 'ac' method won't work!).

1
1 1
1 2 1
1 3 3 1
1 4 6 4 1
1 5 10 10 5 1

(1) $b^2 - 4ac$ (2) $\frac{-b \pm \sqrt{b^2-4ac}}{2a}$

(3) $2x-3 \geq 3$ or $2x-3 \leq -3$

$2x \geq 6$ or $2x \leq 0$

$\{x \mid x \geq 3$ or $x \leq 0\}$

$= (-\infty, 0] \cup [3, \infty)$

(4) $b^2-4ac = (-332)^2 - 4(420)(-1155)$

$= 205624 = 1432^2$

$x = \frac{332 \pm 1432}{840}$ $\frac{21}{10}$, $-\frac{55}{42}$

$420\left(x - \frac{21}{10}\right)\left(x + \frac{55}{42}\right)$

$= (10x - 20)(42x + 55)$

(5) $3(125x^3 - 8y^9)$

$= 3(5x - 2y^3)(25x^2 + 10xy^3 + 4y^6)$

(6) $(2x)^5 + (2x)^4(-y)(5) + 10(2x)^3(-y)^2$

$+ 10(2x)^2(-y)^3 + 5(2x)(-y)^4 + (-y)^5$

$= 32x^5 - 80x^4y + 80x^3y^2 - 40x^2y^3$

$+ 10xy^4 - y^5$

(7) $4x^2 - 20x + 17$

$a=4, b=-20, c=17$

$b^2 - 4ac = (-20)^2 - 4(4)(17)$

$= 400 - 272$

$= 128 = 2 \cdot 8^2$

$\sqrt{128} = 8\sqrt{2}$

2 | 128

2 | 64

2 | 32

2 | 16

2 | 8

2 | 4

2

$x = \frac{20 \pm 8\sqrt{2}}{8} = \frac{5 \pm 2\sqrt{2}}{2}$ ⟶

$4\left(x - \left(\frac{5+2\sqrt{2}}{2}\right)\right)\left(x - \left(\frac{5-2\sqrt{2}}{2}\right)\right)$

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

Complete the square Method

$4x^2 - 20x + 17 = 0$

$x^2 - 5x + \frac{17}{4} = 0$

$x^2 - 5x = -\frac{17}{4}$

$x^2 - 5x + \left(\frac{5}{2}\right)^2 = -\frac{17}{4} + \left(\frac{5}{2}\right)^2 = -\frac{17}{4} + \frac{25}{4} = +\frac{8}{4} = +2$

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

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

$x = \frac{5}{2} \pm \sqrt{2} = \frac{5 \pm 2\sqrt{2}}{2}$, etc

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

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

$\left|x - \frac{5}{2}\right| = \sqrt{2}$

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