TEST 2

Math 104 **Score:** _____ out of 100

2/28/2013 **Name:** Key

Read all of the following information before starting the exam:

- You have 50 minutes to complete the exam.
- Show all work (if necessary), clearly and in order, if you want to recieve full credit. Please make sure you read the directions for each problem. If the problem requires work I reserve the right to take off points if I cannot see how you arrived at your answer (even if your final answer is correct).
- Please box/circle or otherwise indicate your final answers.
- Please keep your written answers brief; be clear and to the point. I will take points off for rambling and for incorrect or irrelevant statements.
- This test has 9 problems (and 1 bonus problem) and is worth 100 points. It is your responsibility to make sure that you have all of the pages!
- All answers must be exact, no rounding. Please keep things in fraction form whenever possible.
- Good luck!

1. Solve for x for each of the following equations.

(a) $-6x + 15 = 3x - 4$

$-3x \quad -3x$

$-9x + 15 = -4$

$-15 \quad -15$

$-9x = -19$

$\frac{-9x}{-9} = \frac{-19}{-9}$

$\boxed{x = \frac{19}{9}}$

(b) $2(x+2)+1 = -3(2x-3)-1$

$2x + 4 + 1 = -6x + 9 - 1$

$2x + 5 = -6x + 8$

$-5 \quad -5$

$2x = -6x + 3$

$+6x \quad +6x$

$8x = 3$

$\boxed{x = \frac{3}{8}}$

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

$+3 \quad +3$

$\frac{1}{2}x + 5 = \frac{2}{3}x$

$5 = \frac{2}{3}x - \frac{1}{2}x$

$5 = \left(\frac{2}{3} - \frac{1}{2}\right)x = \left(\frac{2\cdot 2}{3\cdot 2} - \frac{1\cdot 3}{2\cdot 3}\right)x = \left(\frac{4}{6} - \frac{3}{6}\right)x = \frac{1}{6}x$

$5 = \frac{1}{6}x \rightarrow 5\cdot 6 = x \rightarrow \boxed{x = 30}$

(d) $\frac{2}{x-1} + \frac{3}{x+1} = \frac{4}{x^2-1} = \frac{4}{(x-1)(x+1)}$

$\frac{2(x+1)}{(x-1)(x+1)} + \frac{3(x-1)}{(x-1)(x+1)} = \frac{4}{(x-1)(x+1)}$

$\frac{2(x+1)+3(x-1)}{(x-1)(x+1)} = \frac{4}{(x-1)(x+1)}$

$2(x+1)+3(x-1) = 4$

$2x + 2 + 3x - 3 = 4$

$5x - 1 = 4$

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

$\boxed{x = 1}$

BUT

this cannot be a solution (+1 Bonus.)

2. Find the **slope** and **y-intercept** for each of the following linear equations.

(a) $6x + 2y = 10$

$2y = -6x + 10$

$y = -3x + 5$

m = slope $= -3$; b = y-intercept $= 5$ OR $(0, 5)$

(b) $2x - y = 5$

$-y = -2x + 5$

$y = 2x - 5$

m = slope $= 2$; b = y-intercept $= -5$ OR $(0, -5)$

(c) $\frac{1}{3}x - \frac{2}{5}y = 10$

$-\frac{2}{5}y = -\frac{1}{3}x + 10$

$y = \left(-\frac{5}{2}\right)\left(-\frac{1}{3}x + 10\right)$

$y = \frac{5}{6}x - \frac{50}{2} = \frac{5}{6}x - 25$

m = slope $= 5/6$; b = y-intercept $= -25$ OR $(0, -25)$

3. Find the slope of the line passing through each of the following pairs of points.

(a) $(1, 5)$, and $(0, -15)$.

m = slope $= \frac{-15 - 5}{0 - 1} = \frac{-20}{-1} = 20$

(b) $(-2, -3)$, and $(4, -5)$.

m = slope $= \frac{-5 - (-3)}{4 - (-2)} = \frac{-2}{6} = -\frac{1}{3}$

4. Find the equation of the line passing through the point $(1, -3)$ with slope 4.

Sol 1: use the equation

$$y - y_1 = m(x - x_1)$$

$$y - (-3) = 4(x - 1)$$

$$y + 3 = 4x - 4$$

$$\boxed{y = 4x - 7}$$

Sol 2: use the equation $y = mx + b$

find b:

$$-3 = 4(1) + b$$

$$-7 = b$$

so $\boxed{y = 4x - 7}$

5. Find the equation of the line passing through the point $(3, 4)$ with y-intercept $(0, 3)$.

$$m = \text{slope} = \frac{4-3}{3-0} = \frac{1}{3}$$

Sol 1: use the equation

$$y - y_1 = m(x - x_1)$$

$$y - 3 = \frac{1}{3}(x - 0)$$

$$\boxed{y = \frac{1}{3}x + 3}$$

Sol 2: use $y = mx + b$

$$\boxed{y = \frac{1}{3}x + 3}$$

6. Find the equation of the line passing through the points $(1, 5)$, and $(0, -15)$.

$$m = \text{slope} = \frac{5 - (-15)}{1 - 0} = \frac{5 + 15}{1} = 20$$

Sol 1:

$$y - y_1 = m(x - x_1)$$

$$y - 5 = 20(x - 1)$$

$$y - 5 = 20x - 20$$

$$\boxed{y = 20x - 15}$$

Sol 2: $y = mx + b$

$$\boxed{y = 20x - 15}$$

7. Find the x-intercept of the linear equation $2x + \frac{1}{4}y = 8$.

$$2x + \frac{1}{4}(0) = 8$$

$$2x = 8$$

$$\boxed{x = 4} \quad \text{OR} \quad \boxed{(4, 0)}$$

8. You have an older car (65' Rambler) worth \$4,500 today and the value is decreasing linearly by \$260 every year.

(a) Write an equation for the value of your car after x years.

car value = $4500 - 260x$

(b) Using your equation, find the value of your car 4 years from now.

car value after 4 years $= 4500 - 260(4) = 4500 - 1040 =$ \$3460

9. Fisticuffs Mucker Hockey Importium is a local hockey store running in a purely competitive market with the following monthly financial information:

Fixed Cost = \$2700
Variable Cost (per unit) = \$40 per unit
Revenue (per unit) = \$95 per unit

(a) Write an equation for the monthly **total cost** for x units.

Total Cost for x units $=$ Fixed Cost $+$ Variable cost $\cdot x =$ $2700 + 40x$

(b) Use (a) to determine the total cost for 100 units.

$2700 + 40(100) =$ \$6700

(c) Write an equation for the monthly **total revenue** for x units.

Total Revenue $=$ Revenue per unit $\cdot x =$ $95x$

(d) Use (c) to determine the total revenue for 100 units.

$95(100) =$ \$9500

(e) Write an equation for the monthly **profit** for x units.

PROFIT = Total Revenue − Total Cost $= 95x - (2700 + 40x)$
$= 55x - 2700$

(f) Use (e) to determine to the total profit for 100 units.

$55(100) - 2700 =$ \$2800

or

\$9500 − \$6700 = \$2800

10. ♠ Extra Credit: Write the equation of a line passing through the point $(1, 3)$ perpendicular to the line that passes through the two points $(2, 4)$ and $(-6, 7)$.

$$m = \text{slope} = \frac{4-7}{2-(-6)} = \frac{-3}{8}$$

$$\text{perpendicular slope} = m_{\perp} = \frac{-1}{\left(\frac{-3}{8}\right)} = \frac{8}{3}$$

$$y - 3 = \frac{8}{3}(x - 1)$$

$$y - 3 = \frac{8}{3}x - \frac{8}{3}$$

$$\boxed{y = \frac{8}{3}x + \frac{1}{3}}$$