Math 099 - Summer 2014 - Test 2

25 + 25 + 32 + 18 = 100

Instructor: Dr. Francesco Strazzullo Name KEY

Instructions. Only calculators are allowed on this examination. Point values of each problem are indicated. **Always use the appropriate wording and units of measure in your answers (when applicable). SHOW YOUR WORK NEATLY, PLEASE (no work, no credit).**

1. (10*pts*) Write the equation of the horizontal line passing through $\left(-\frac{4}{3}, 5\right)$.

HORIZ LINE, $Y = b$
PLUG POINT $(-\frac{4}{3}, 5)$ $\to$ $5 = b$ $\to$

$\to$ $\boxed{Y = 5}$

2. (15*pts*) Write the equation of the line passing through $(2, 1)$ and perpendicular to the line $3x + 6y = 5$.

WE LOOK FOR $Y = mX + b$ PERPENDICULAR TO GIVEN LINE $3X + 6Y = 5$, WHOSE SLOPE IS:

$\frac{6Y}{6} = \frac{-3X + 5}{6}$ $\to$ $Y = -\frac{1}{2}X + \frac{5}{6}$, GIVEN SLOPE IS $-\frac{1}{2}$ THEN $m = -\frac{1}{-\frac{1}{2}} = 2$.

PLUG $(2, 1)$ IN $Y = 2X + b$: $1 = 2(2) + b$
$\quad -4 \quad -4$

$\to$ $b = -3$. THEN

$\boxed{Y = 2X - 3}$

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3. (10*pts*) Write the slope-intercept form of the line $3x - 4y = 12$.

SOLVE FOR Y: $12 = 3X - 4Y$

$-12 + 4Y \qquad +4Y - 12$

$\rightarrow \frac{4Y}{4} = \frac{3X - 12}{4}$

$$\boxed{Y = \frac{3}{4}X - 3}$$

4. (15*pts*) Write the equation of the line passing through the points $(1, 2)$ and $(-4, 3)$.

SLOPE $m = \frac{Y_2 - Y_1}{X_2 - X_1} = \frac{3 - 2}{-4 - 1} = \frac{1}{-5} = -\frac{1}{5}$

PLUG POINT $(1,2)$ IN $Y = -\frac{1}{5}X + b$:

$2 = -\frac{1}{5}(1) + b \rightarrow b = 2 + \frac{1}{5} = \frac{11}{5}$

$$\boxed{Y = -\frac{1}{5}X + \frac{11}{5}}$$

25

5. (16pts) Solve the system of linear equations $\begin{cases} 6x & +y & =-3 \\ 3x & -2y & =4 \end{cases}$

BY GRAPH OR ALGEBRA:

$2 \cdot EQ_1 \to 12X + 2Y = -6$

$\quad\quad\quad\quad\; 3X - 2Y = 4$

$\quad\quad\quad\quad\; 15X \quad\quad = -2$

$\to X = -\frac{2}{15} \to$ PLUG IN

$EQ_1: 6\left(-\frac{2}{15}\right) + Y = -3 \to$

$\to -\frac{4}{5} + Y = -3 \to Y = -\frac{11}{5}$

$-3 + \frac{4}{5}$

SOLUTION: $\left(-\frac{2}{15}, -\frac{11}{5}\right) =$

$(-.1\bar{3}, -2.2)$.

CHECK IN EQ_2:

$3\left(-\frac{2}{15}\right) - 2\left(-\frac{11}{5}\right) = \frac{-2+22}{5}$

$= 4$ ✓

6. (16pts) Consider the system of inequalities below. Graph and label the corner point for the solution set.

$\begin{cases} x - 2y > 4 \\ y \geq 2x - 1 \end{cases}$

$x - 2y > 4 \to (-2Y > -X + 4)/-2 \to Y < \frac{1}{2}X - 2$ DASHED BELOW

$y \geq 2x - 1 \to$ SOLID, ABOVE

CORNER POINT BY SUBSTITUTION

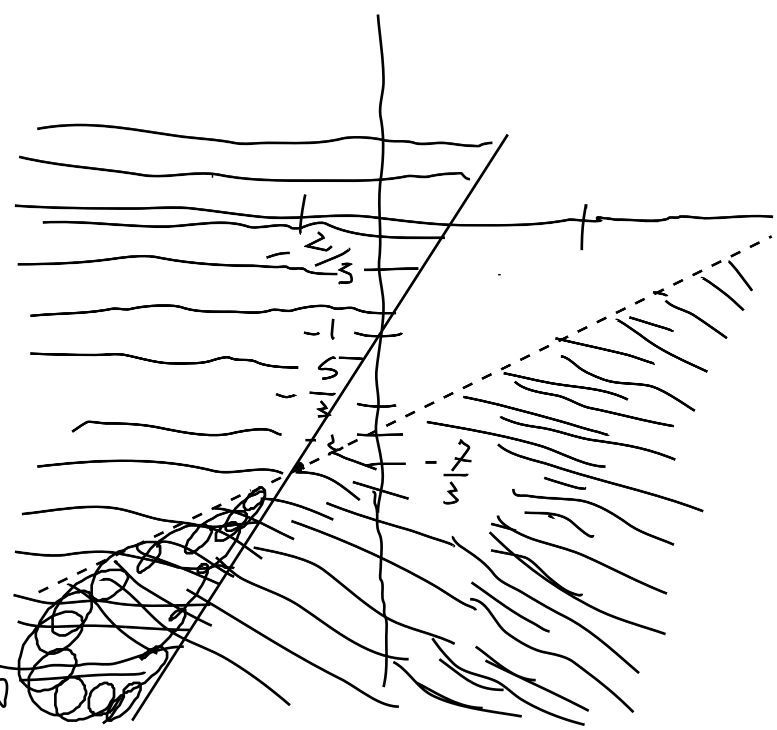
$\frac{1}{2}X - 2 = 2X - 1 \to$

$\to \frac{3}{2}X = -1 \to X = -\frac{2}{3}$.

$\to Y = -\frac{7}{3}$

$\left(-\frac{2}{3}, -\frac{7}{3}\right)$

SOLUTION REGION



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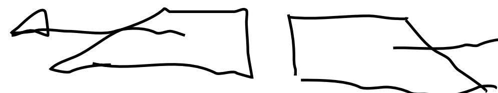
7. (*18pts*) Two trains leave the same station traveling in opposite directions, one to Miami and the other to Chicago. The one to Miami leaves at 6:00 AM (ET) and travels at a constant speed of 180 miles per hour, while the other one leaves at 7:30 AM (ET) and travels at a constant speed of 250 mi/h. At what time (ET) will the trains be 1000 miles apart? Hint: considering the time each train travels, model this problem with a system of linear equations, solve the system, and state the time correct to the minute.

@250 mi/h @ 180 mi/h

CHICAGO  MIAMI

7:30 AM 6:00 AM

X = "HOURS TRAVELED TO MIAMI"

1000 mi DISTANCE

250Y 180X

Y = "h TRAVELED TO CHICAGO"

D = R T

$$\begin{cases} X - Y = 1.5 \longrightarrow X = Y + 1.5 \quad \text{SUBSTITUTION} \\ 180X + 250Y = 1000 \longrightarrow 180(Y+1.5) + 250Y = 1000 \end{cases}$$

$$\longrightarrow 180Y + 270 + 250Y = 1000 \quad \Big| \longrightarrow \frac{430Y}{430} = \frac{730}{430} \longrightarrow$$
$$\quad -270 \qquad\qquad -270$$

$$\longrightarrow Y = \frac{73}{43} \approx 1.7\ h = 1\ h\ 42\ min \longrightarrow \text{PLUG IN SUBS}$$

$$X = \frac{73}{43} + \frac{3}{2} = \frac{275}{86} \approx 3.20\ h = 3\ h\ 12\ min$$

THESE TRAINS ARE 1000 mi APART 3 h 12 min AFTER 6 AM (ET), THAT IS AT 9:12 AM (ET)

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