Math 099 - Summer 2013 - Test 2

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 slope-intercept form of the line $3x - 4y = 12$.

SLOPE-INTERCEPT FORM: $y = mx + b$

SOLVE FOR y: $3x - 4y = 12$

$ -3x -3x$ $\longmapsto$ $\dfrac{-4y}{-4} = \dfrac{-3x}{-4} + \dfrac{12}{-4}$ $\longmapsto$ $\boxed{y = \dfrac{3}{4}x - 3}$

2. (10*pts*) Write the equation of the vertical line passing through $\left(\dfrac{3}{2}, 2\right)$.

VERTICAL LINE: $X = a$

PLUG POINT $\left(\dfrac{3}{2}, 2\right)$: $\dfrac{3}{2} = a$ $\longmapsto$ $\boxed{X = \dfrac{3}{2}}$

1

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3. (10*pts*) Write the equation of the line passing through $(-1, 2)$ and parallel to the line $4x - 2y = 3$.

PARALLEL MEANS "SAME SLOPE" IF NONE IS A VERTICAL LINE: $Y = mx + b$

AND m IS THE SLOPE OF $4X - 2Y = 3$.

$$4X - 2Y = 3 \rightarrow -2Y = -4X + 3 \rightarrow Y = 2X - \frac{3}{2} \rightarrow m = 2.$$
$$-4X \quad -4X \quad \overline{-2} \quad \overline{-2} \ \overline{-2}$$

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

THEN : $\boxed{Y = 2X + 4}$

4. (10*pts*) Write the equation of the line passing through the points $(2, -1)$ and $(3, 4)$.

SLOPE $= \dfrac{X_1 - X_2}{X_1 - X_2} = \dfrac{-1 - 4}{2 - 3} = \dfrac{-5}{-1} = 5 \rightarrow m = 5$

PLUG $(2, -1)$ INTO $Y = 5X + b$: $\quad -1 = 5(2) + b \rightarrow b = -11$
$$-10 \quad -10$$

THEN : $\boxed{Y = 5X - 11}$

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USING POINT-SLOPE : $\quad Y - Y_1 = m(X - X_1) \qquad (X_1, Y_1)$

POINT $(2, -1)$

$Y - (-1) = 5(X - 2) \rightarrow Y + 1 = 5X - 10 \rightarrow Y = 5X - 11$
$$\qquad\qquad\qquad\qquad\qquad\qquad -1$$

2

$\boxed{20}$

5. (15pts) Solve the system of linear equations $\begin{cases} 10x & -y & = 2 \\ 5x & +2y & = -1 \end{cases}$

BY ELIMINATION (ADDITION): $2 \cdot EQ_1$

$$20X - 2Y = 4$$
$$5X + 2Y = -1$$
$$\overline{\qquad}$$
$$\frac{25X}{25} = \frac{3}{25} \quad \longrightarrow$$

$\longrightarrow X = \frac{3}{25}$

$\frac{6}{5}$

PLUG IN EQ_1: $\overline{10\left(\frac{3}{25}\right)} - Y = 2 \longrightarrow Y = -\frac{4}{5} \longrightarrow \boxed{\left(\frac{3}{25}, -\frac{4}{5}\right)}$

$-2 \quad + Y \quad -2$

CHECK: PLUG IN EQ_2 $\quad 5\left(\frac{3}{25}\right) + 2\left(-\frac{4}{5}\right) = \frac{3}{5} - \frac{8}{5} = -\frac{5}{5} = -1 \checkmark$

6. (*15 points*) A pharmacist wants to mix two solutions to obtain $450\,cc$ of a solution that has a 18% concentration of a certain medicine. If one solution has a 10% concentration of the medicine and the other has a 25% concentration, how much of each solution should she mix?

ITEMS	Q cc	R %	QR
SOLUTION @ 10%	X	.10	.10X
SOLUTION @ 25%	Y	.25	.25Y
TOTAL (@ 18%)	X+Y =450	.18	.10X+.25Y = .18(450)

$\longrightarrow$

TOTAL QUANTITY EQUATION $\begin{cases} X + Y = 450 \\ \end{cases}$

TOTAL VALUE EQUATION $\begin{cases} .10X + .25Y = 81 \end{cases}$

BY SUBSTITUTION. EQ_1: $\quad X = 450 - Y \quad \underset{IN\ EQ_2}{\overset{PLUG}{\longrightarrow}}$

$\longrightarrow .10(450 - Y) + .25Y = 81 \longrightarrow 45 - .10Y + .25Y = 81 \longrightarrow$
$\qquad\qquad\qquad\qquad\qquad\qquad -45 \qquad\qquad\qquad\qquad\qquad -45$

$\longrightarrow \frac{.15Y}{.15} = \frac{36}{.15} \longrightarrow \boxed{Y = 240 \quad CC \ AT \ 25\%}$

$\boxed{X = 450 - 240 = 210 \quad CC \ AT \ 10\%}$

30

7. (15*pts*) Graph and show the solution set and label the corner point for the system of inequalities

$$\begin{cases} 2x + y \geq 1 \longrightarrow Y \geq -2X+1 \quad \text{SOLID BOUNDARY LINE} \perp. \text{ REGION ABOVE} \boxed{\geq} \\ y < x - 2 \longrightarrow \text{DASHED BOUNDARY LINE} 2. \text{ REGION BELOW} \boxed{<} \end{cases}$$
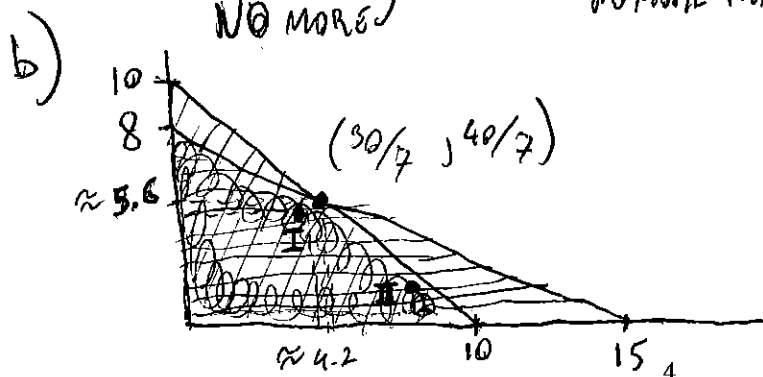
CORNER POINT $(1, -1)$

-2

8. (15*pts*) A dieter is allowed 120 calories for a snack. She can have a combination of animal crackers and peeled carrots. Animal crackers contain 8 calories each and peeled carrots contain 15 calories. She can not eat more than 10 items for a snack. Let x = the number of crackers and y = the number of carrots for a snack.

   (a) Write a system of linear inequalities to describe the possible numbers of each items the dieter can eat.

   (b) Graph and show the solution set in this context. Label the corner point.

   (c) Provide two possible choices for a snacks.

ITEM	Q	CAL/EA	Q·R CAL
CRACKERS	X	8	8X
CARROTS	Y	15	15Y
TOTAL	X+Y ≤ 10		8X+15Y ≤ 120

NO MORE

NO MORE THAN 120 CAL.

b)

10
8
≈ 5.6

$\left(\frac{30}{7}, \frac{40}{7}\right)$

≈ 4.2   10   15

a)
$$\text{SYST.} \begin{cases} X+Y \leq 10 \\ 8X+15Y \leq 120 \end{cases}$$

SOLVE FOR Y

$$\begin{cases} Y \leq -X + 10 \quad \text{SOLID.} \\ Y \leq -\frac{8}{15}X + 8 \quad \text{REG. BELOW} \end{cases}$$

IN THIS CONTEXT
$X \geq 0$ AND $Y \geq 0$

c) I) 4 CRACKERS, 5 CARROTS
   II) 9 CRACKERS, 1 CARROT

30)