 Name: KEY

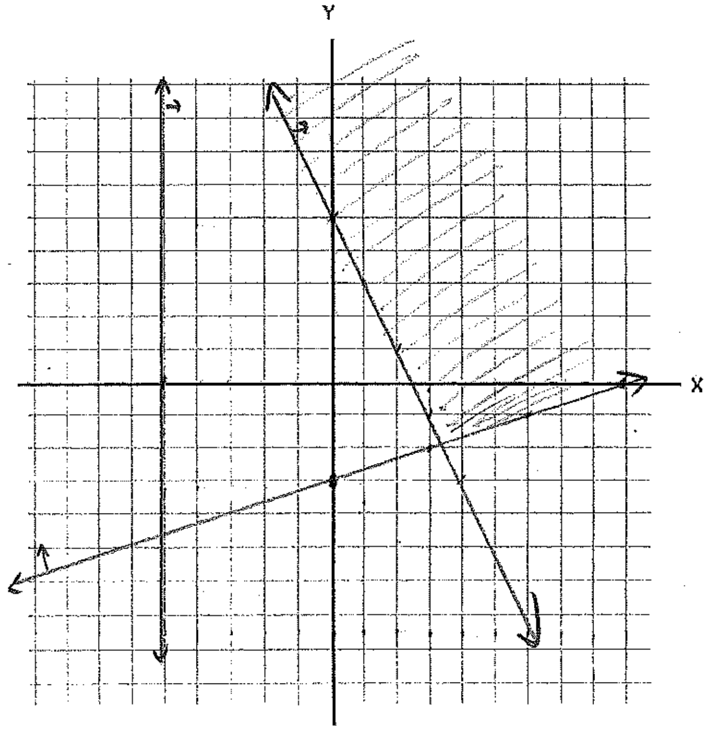
1. Graph the constraints below. Label all corner points. Then use the objective function: $C = 2x + 12y$

$$\begin{cases} x - 3y \le 9 \\ -x \le 5 \\ 4x + 2y \ge 10 \end{cases}$$

$3y \ge x - 9 \quad y \ge \frac{1}{3}x - 3$

$x \ge -5$

$y \ge -2x + 5$



$2\left(\frac{24}{7}\right) + 12\left(-\frac{13}{7}\right) = -\frac{108}{7}$

What is the minimum value of C? $-108/7$

What are the values of x and y at the minimum value of C? $\left(\frac{24}{7}, \frac{-13}{7}\right)$

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

$\frac{7}{3}x = 8$

$x = \frac{24}{7}$

$y = -2\left(\frac{24}{7}\right) + 5 = \frac{-13}{7}$

2. Sketch the graph of the system of inequalities.

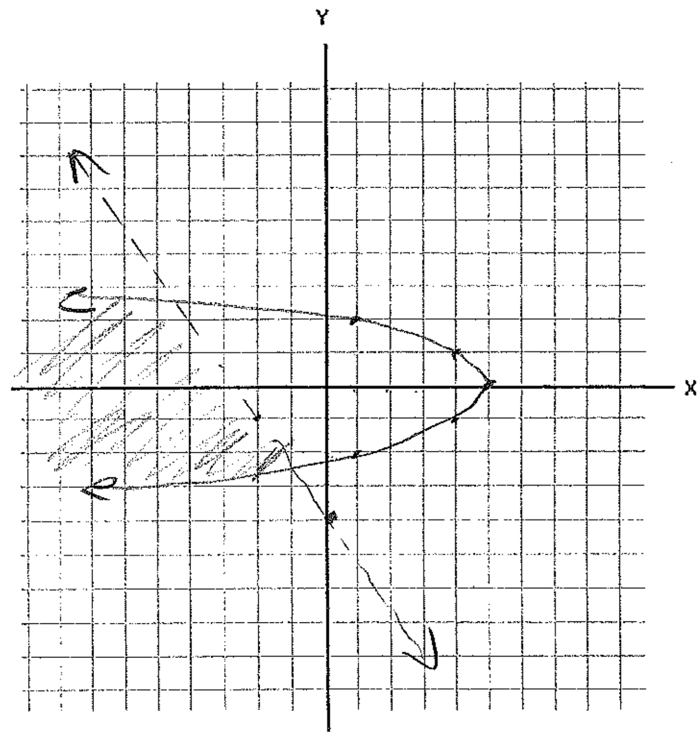
$$\begin{cases} x + y^2 \le 5 \\ 3x + 2y < -8 \end{cases}$$

$y^2 \le -x + 5$

$y \le \pm\sqrt{-x+5}$

$2y < -3x - 8$

$y < -\frac{3}{2}x - 4$



3) A merchant plans to sell two models of MP3 players at costs of $250 and $300. The $250 model yields a profit of $25 per unit and the $300 model yields a profit of $40 per unit. The merchant estimates that the total monthly demand will not exceed 25 units. The merchant does not want to invest more than $6600 in inventory for these products. What is the optimal inventory level for each model? What is the optimal profit?

x = model A (250)
y = $300 model

Write the constraints (inequalities) for this situation- include the implied ones as well!

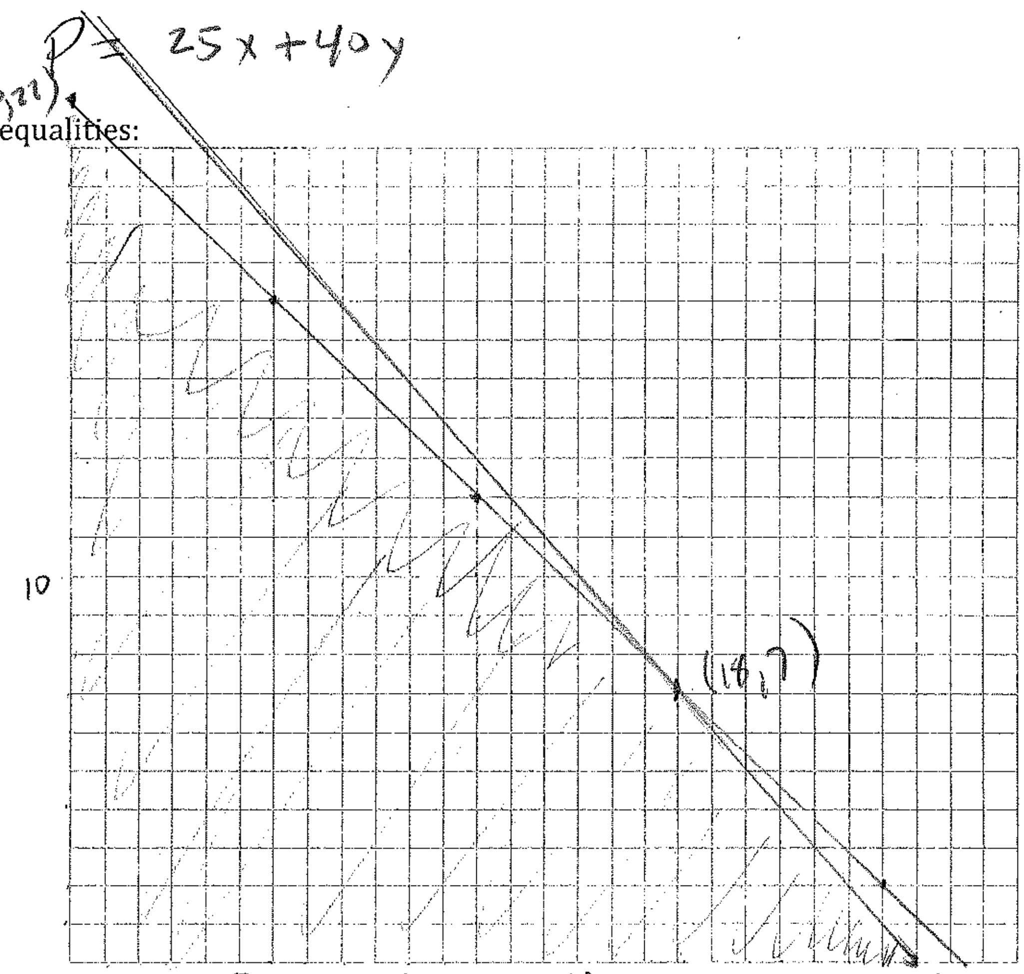
$x + y \le 25$ $\quad$ $y \le 25 - x$ $\quad$ $x \ge 0$

$250x + 300y \le 6600$ $\quad$ $y \le 22 - \frac{5}{6}x$ $\quad$ $y \ge 0$

Write a profit equation:

$P = 25x + 40y$

Graph the inequalities:



What are the corner points?

(25,0), (0,22), (18,7)

a) What is the maximum profit?

Profit = $880

b) How many \$250 and how many \$350 models should be created in order to maximize profit?

\$250 model = 0

\$350 model = 22

4) It takes 2 minutes to make a sub and 3 minutes to make a pizza. The owner of a shop will make a \$6 profit on subs and \$12 profit on pizzas. The owner has just 30 minutes to make this food. The owner also wants to make at least 12 items to sell.

a. Let **x** be the number of subs and y be the number of pizzas. Give a set of constraints for this problem.

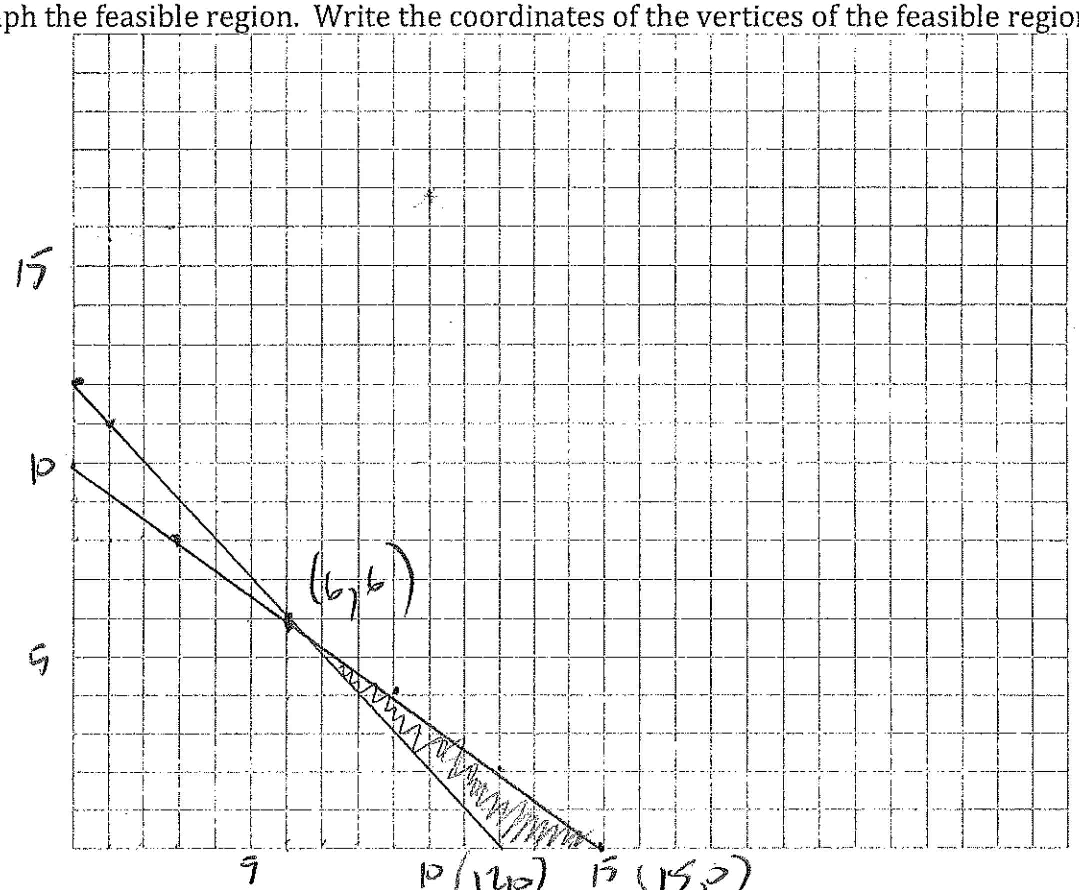
$x \geq 0$ $\quad 2x + 3y \leq 30 \quad y \leq -\frac{2}{3}x + 10$

$y \geq 0$ $\quad x + y \geq 12$

b. What is the objective quantity for this problem?

$P = 6x + 12y$

c. Graph the feasible region. Write the coordinates of the vertices of the feasible region here.



d. How many subs and how many pizzas should the owner make if the object is to maximize profits? What is the maximum profit?

(6,6) $\boxed{\$108}$

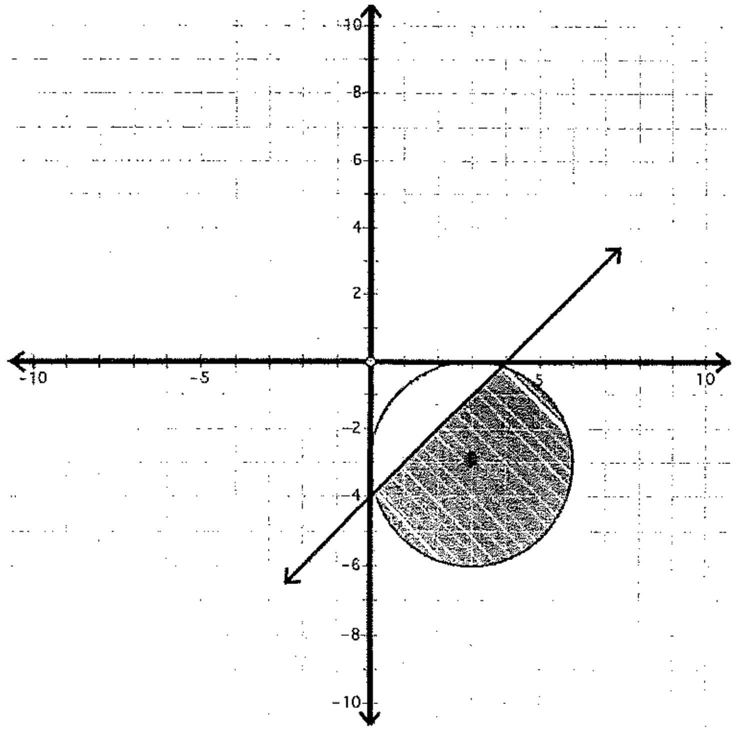
Sections 7.1 – 7.3 I.C.E

Derive a set of inequalities to describe the region in the graph below.

5)

$y \le x - 4$

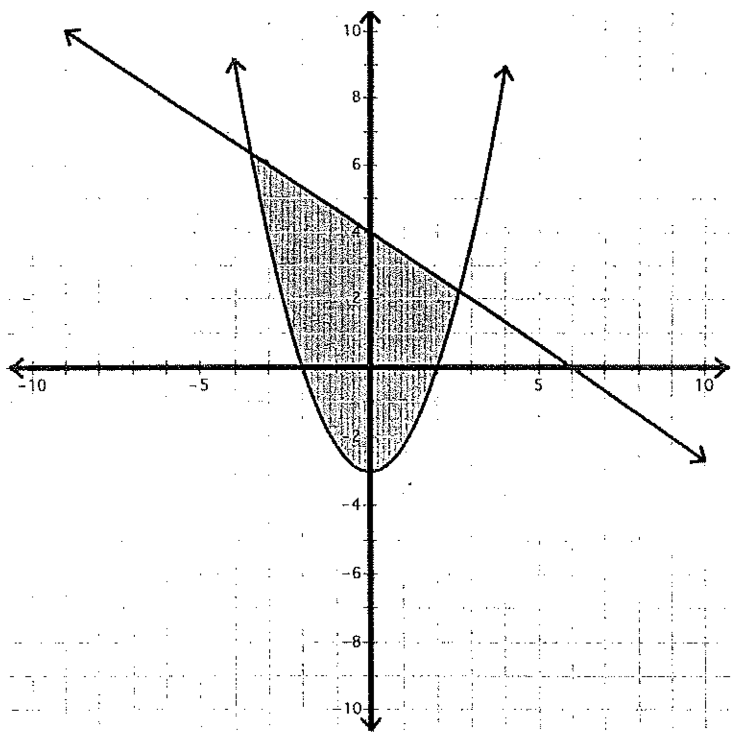
$(x-3)^2 + (y+3)^2 \le 9$



6)

$y \ge \frac{3}{4}x^2 - 3$

$y \le -\frac{2}{3}x + 4$



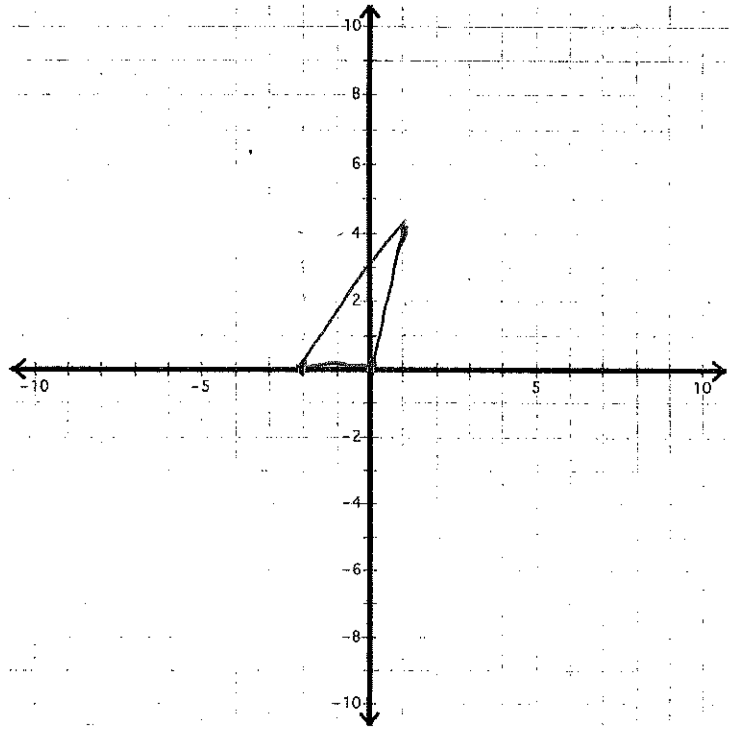
Sections 7.1 – 7.3 I.C.E

7) Given the points of a triangle with vertices (0,0), (-2,0) and (1,4), find a set of inequalities to describe the region.

$$\boxed{\begin{aligned} &y \geq 0 \\ &y \geq 4x \\ &y \leq \tfrac{4}{3}x + \tfrac{8}{3} \end{aligned}}$$

$0 = \frac{4}{3}(-2) + b$

$+\frac{8}{3} = b$



$1 \leq 0$