3.4 Linear Programming

Learning Targets for today

- To be able to solve problems using linear programming.

Vocabulary

Linear Programming – the method for finding a minimum or maximum value of some quantity, given a set of constraints.

Constraints – A set of inequalities that form the feasible area of the system.

Feasible Area – contains all the points that satisfy all of the constraints (Shaded Region)

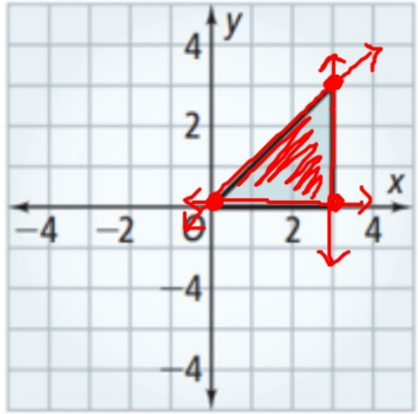
Objective Function – The quantity the constraints maximize or minimize.

KEY CONCEPT

If there is a maximum or a minimum value of a linear objective function, it occurs at one or more vertices of the feasible region.

The graph at the right shows a feasible region. Write the coordinates at which a maximum or minimum value of a linear objective function could occur.

(0, 0) (3, 3) (3, 0)

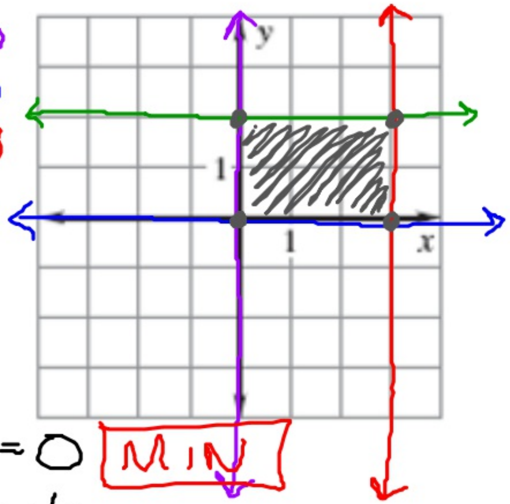


Using Linear Programming

Example for you..

Graph each system of inequalities. Write all verities. Then find the value of x and y that maximize and minimizes the objective function.

1. $\begin{cases} x \geq 0 & x=0 \\ y \geq 0 & y=0 \\ x \leq 3 & x=3 \\ y \leq 2 & y=2 \end{cases}$



Maximum for

$R = 2x + 3y$

$\boxed{(0,0)}$ $R=2(0)+3(0)=0$ $\boxed{\text{MIN}}$

$(3,0)$ $R=2(3)+3(0)=6$

$\boxed{(3,2)}$ $R=2(3)+3(2)=12$ $\boxed{\text{MAX}}$

$(2,0)$ $R=2(2)+3(0)=4$

Using Linear Programming

Example for you..

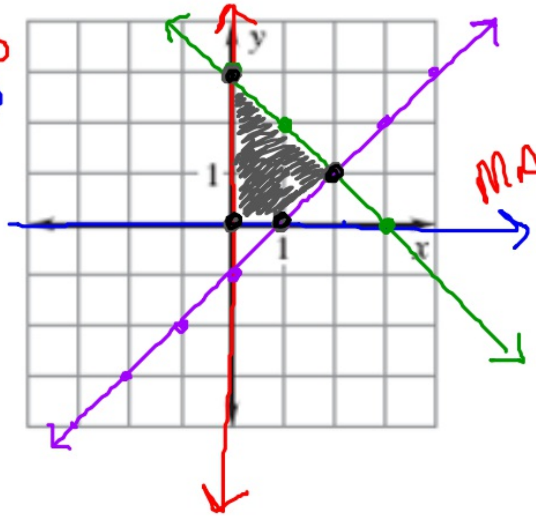
Graph each system of inequalities. Write all verities. Then find the value of x and y that maximize and minimizes the objective function.

2. $\begin{cases} x \geq 0 & x=0 \\ y \geq 0 & y=0 \\ y \geq -x+3 \\ y - x \leq -1 \end{cases}$

$+x \quad +x$

$y \leq x - 1$

Maximum for
R = 4x + 2y



$R = 4x + 2y$

$(0,0) \quad R = 4(0) + 2(0) = 0$

$(1,0) \quad R = 4(1) + 2(0) = 4$

MAX! $\boxed{(2,1)} \quad R = 4(2) + 2(1) = 10$

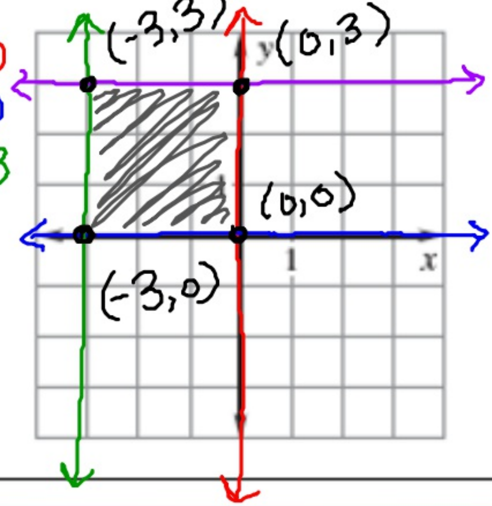
$(0,3) \quad R = 4(0) + 2(3) = 6$

Using Linear Programming

Your Turn to Try…

Graph each system of inequalities. Write all verities. Then find the value of x and y that maximize and minimizes the objective function.

$$1. \begin{cases} x \leq 0 & x=0 \\ y \geq 0 & y=0 \\ x \leq -3 & x=-3 \\ y \leq 3 & y=3 \end{cases}$$



Minimum for
R = x + 4y

$R = x + 4y$

$(0,0)$ $R = 0 + 4(0) = 0$

$(0,3)$ $R = 0 + 4(3) = 12$

$\boxed{(-3,0)}$ $R = -3 + 4(0) = -3$ $\boxed{\text{Min!}}$

$(-3,3)$ $R = -3 + 4(3) = 9$

Using Linear Programming

Problem for you..

Graph each system of inequalities. Write all verities. Then find the value of x and y that maximize and minimizes the objective function.

$R = 5x + 3y$

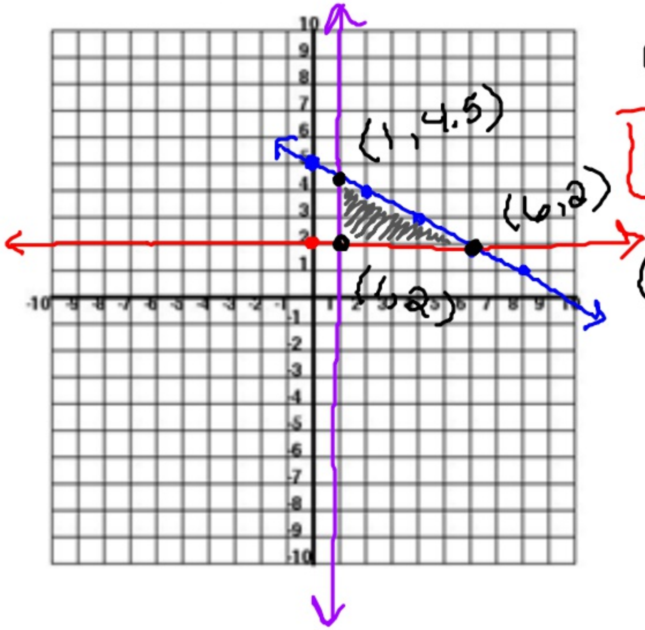
3. $\begin{cases} y \geq 2 \\ x \geq 1 \\ x + 2y \leq 10 \end{cases}$ $y=2$ $x=1$

$\quad -x \qquad\qquad -x$

$\frac{2y}{2} \leq \frac{-x}{2} + \frac{10}{2}$

$y \leq -\frac{1}{2}x + 5$

Maximum for
R = 5x + 3y



$(1, 4.5)$ $R = 5(1) + 3(4.5) = 18.5$

$\boxed{(6,2)}$ $R = 5(6) + 3(2) = 36$

MAX!

$(1,2)$ $R = 5(1) + 3(2) = 11$