

SYSTEM OF LINEAR INEQUALITIES Assignment

Solve the following inequalities and graph its solution

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

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

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

4.
$$\begin{cases} x + y \geq -1 \\ x + y \leq 2 \end{cases}$$

5.
$$\begin{cases} x + y \leq 4 \\ 3x + y \leq 6 \end{cases}$$

6.
$$\begin{cases} y \geq 2x + 1 \\ y \geq -x + 3 \end{cases}$$

Solve the following word problem:

7. Jessica works as an online tutor for \$6 per hour. She also works as an editor for \$3. She is allowed to work 30 hours per week and she wants to make at most \$60. Write and graph a system of linear inequalities.
8. Fuel from PDV pump A costs \$4 per gallon and from PDV pump B costs \$2 per gallon. Marc has at most \$24 to spend on fuel. Write and graph a system of linear inequalities.

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ANSWERS

Solve the following inequalities and graph its solution

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

We have to graph each of the linear function that compound the system. One easy way to graph each linear function is to find its intercepts with the axes.

- $y = -x$

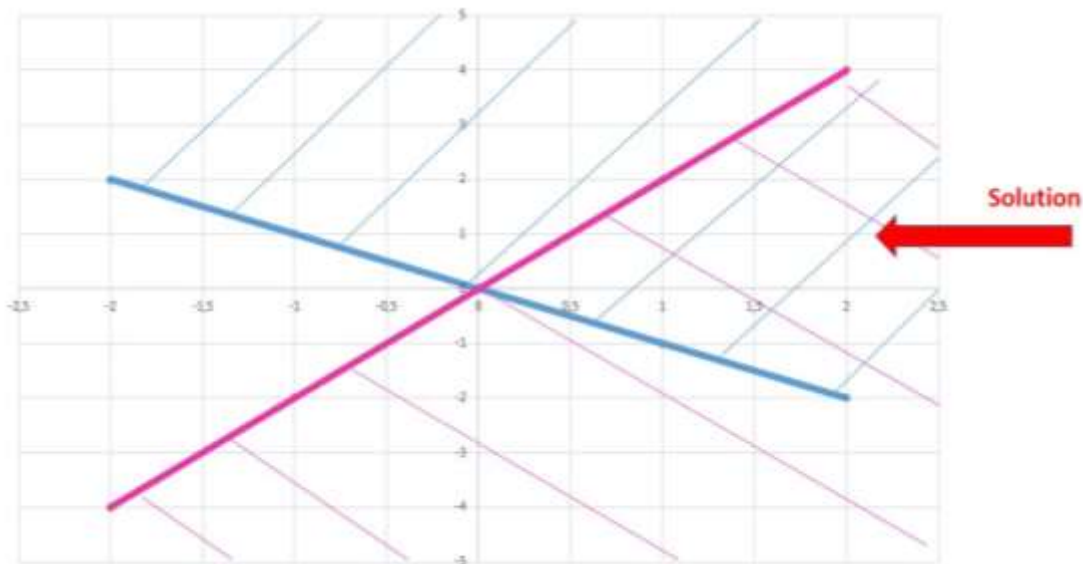
$$x = 0 \rightarrow y = 0 \rightarrow (0,0)$$

$$y = 2 \rightarrow x = -2 \rightarrow (-2,2)$$

- $y = 2x$

$$x = 0 \rightarrow y = 0 \rightarrow (0,0)$$

$$y = 2 \rightarrow x = 4 \rightarrow (4,2)$$



Proving with the point (1,1) that belongs to the solution region to verify if it satisfies the inequalities:

$$1 + 1 \geq 0 \rightarrow 2 > 0$$

$$2(1) - 1 \geq 0 \rightarrow 1 > 0$$

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

We have to graph each of the linear function that compound the system. One easy way to graph each linear function is to find its intercepts with the axes.

- $y = -3x$

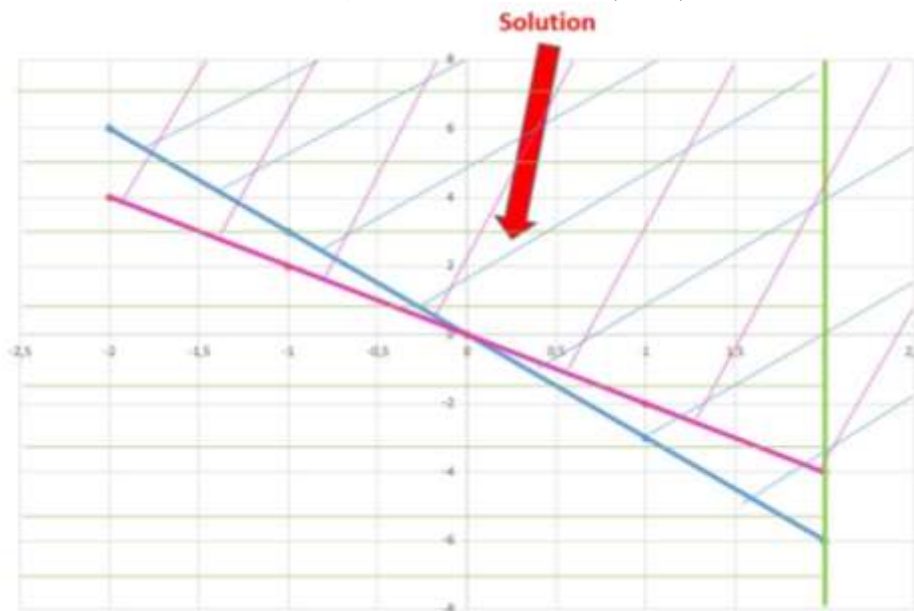
$$x = 0 \rightarrow y = 0 \rightarrow (0,0)$$

$$y = 6 \rightarrow x = -2 \rightarrow (-2,6)$$

- $y = -2x$

$$x = 0 \rightarrow y = 0 \rightarrow (0,0)$$

$$y = 4 \rightarrow x = -2 \rightarrow (-2,4)$$



Proving with the point (1,2) that belongs to the solution region to verify if it satisfies the inequalities:

$$3(1) + 2 \geq 0 \rightarrow 5 > 0$$

$$2(1) + 2 \geq 0 \rightarrow 4 > 0$$

$$1 < 2$$

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

We have to graph each of the linear function that compound the system. One easy way to graph each linear function is to find its intercepts with the axes.

- $y = -x + 3$

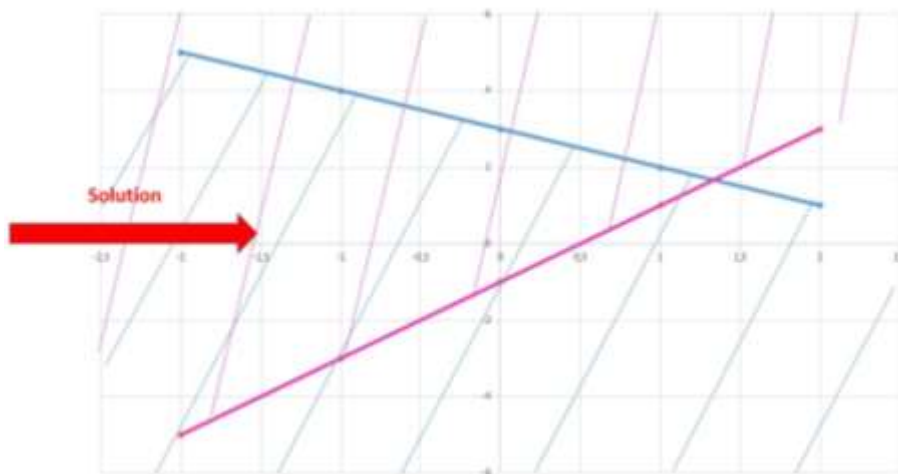
$$x = 0 \rightarrow y = 3 \rightarrow (0, 3)$$

$$y = 2 \rightarrow x = 1 \rightarrow (2, 1)$$

- $y = 2x - 1$

$$x = 0 \rightarrow y = -1 \rightarrow (0, -1)$$

$$y = 3 \rightarrow x = 2 \rightarrow (2, 3)$$



Proving with the point $(-1, 2)$ that belongs to the solution region to verify if it satisfies the inequalities:

$$y \leq -x + 3 \rightarrow 2 \leq 1 + 3 \rightarrow 2 < 4$$

$$y \geq 2x - 1 \rightarrow 2 \geq 2(1) - 1 \rightarrow 2 > 1$$

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4.
$$\begin{cases} x + y \geq -1 \\ x + y \leq 2 \end{cases}$$

We have to graph each of the linear function that compound the system. One easy way to graph each linear function is to find its intercepts with the axes.

- $y = -x - 1$

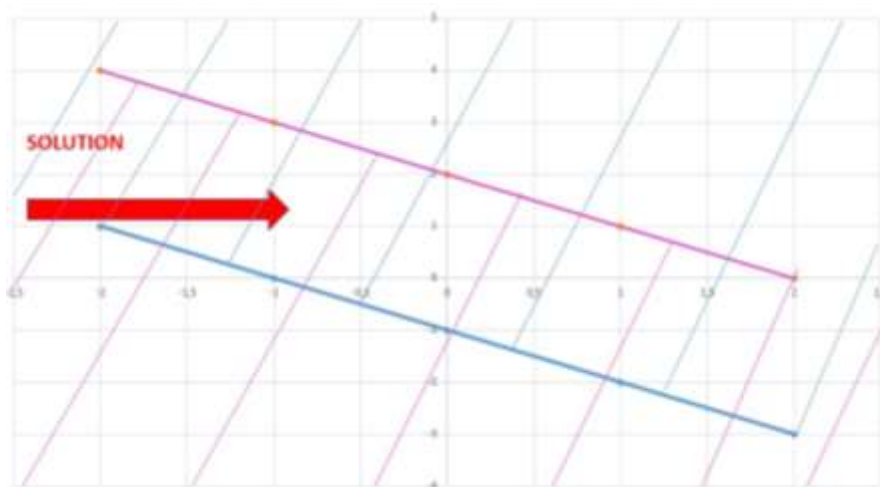
$$x = 0 \rightarrow y = -1 \rightarrow (0, -1)$$

$$y = 1 \rightarrow x = -2 \rightarrow (-2, 1)$$

- $y = -x + 2$

$$x = 0 \rightarrow y = 2 \rightarrow (0, 2)$$

$$y = 0 \rightarrow x = 2 \rightarrow (2, 0)$$



Proving with the point $(0,0)$ that belongs to the solution region to verify if it satisfies the inequalities:

$$0 \geq -0 - 1 \rightarrow 0 \geq -1$$

$$0 \leq -0 + 2 \rightarrow 0 < 2$$

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5.
$$\begin{cases} x + y \leq 4 \\ 3x + y \leq 6 \end{cases}$$

We have to graph each of the linear function that compound the system. One easy way to graph each linear function is to find its intercepts with the axes.

- $y = -x + 4$

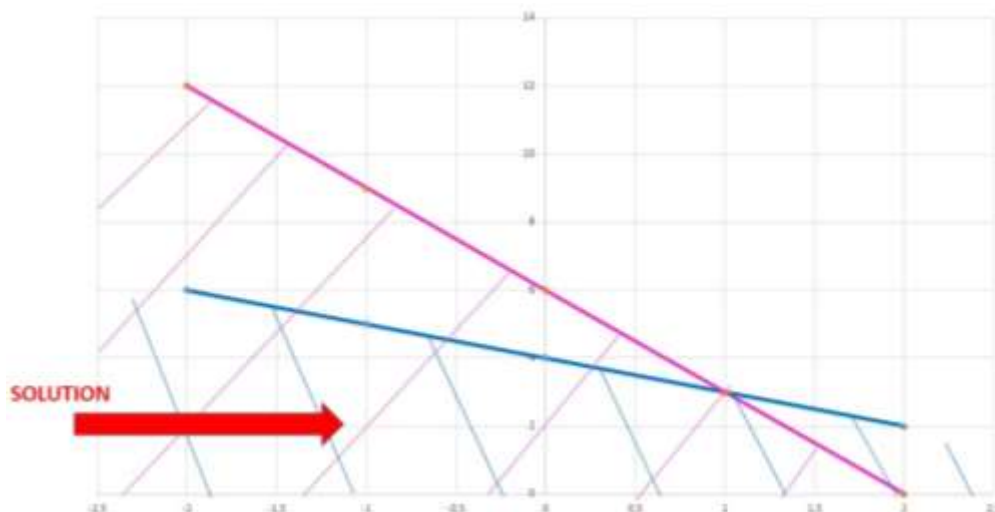
$$x = 0 \rightarrow y = 4 \rightarrow (0,4)$$

$$y = 2 \rightarrow x = 2 \rightarrow (2,2)$$

- $y = -3x + 6$

$$x = 0 \rightarrow y = 6 \rightarrow (0,6)$$

$$y = 0 \rightarrow x = 2 \rightarrow (2,0)$$



Proving with the point $(0, 2)$ that belongs to the solution region to verify if it satisfies the inequalities:

$$2 \leq -0 + 4 \rightarrow 2 < 4$$

$$2 < -3(0) + 6 \rightarrow 2 < 6$$

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6.
$$\begin{cases} y \geq 2x + 1 \\ y \geq -x + 3 \end{cases}$$

We have to graph each of the linear function that compound the system. One easy way to graph each linear function is to find its intercepts with the axes.

- $y = 2x + 1$

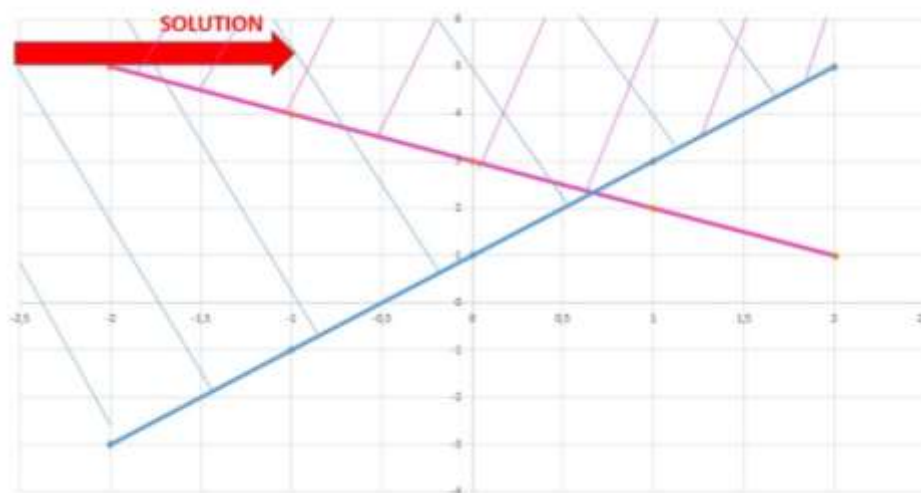
$$x = 0 \rightarrow y = 1 \rightarrow (0,1)$$

$$y = 5 \rightarrow x = 2 \rightarrow (2,5)$$

- $y = -x + 3$

$$x = 0 \rightarrow y = 3 \rightarrow (0,3)$$

$$y = 1 \rightarrow x = 2 \rightarrow (2,1)$$



Proving with the point (1, 4) that belongs to the solution region to verify if it satisfies the inequalities:

$$4 \geq 2(1) + 1 \rightarrow 4 > 3$$

$$4 \geq -1 + 3 \rightarrow 4 > 2$$

Solve the following word problem:

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7. Jessica works as an online tutor for \$6 per hour. She also works as an editor for \$3. She is allowed to work 30 hours per week and she wants to make at most \$60. Write and graph a system of linear inequalities.

SOLUTION

Let's define the variables that represent the system:

X= hours worked as online tutor

Y= Hours worked as editor

- As an online tutor she earns \$6 per hour and as editor \$3 to make at most \$60, so the inequality is represented as follows:

$$6x + 3y \leq 60 \rightarrow \text{simplifying} \rightarrow 2x + y \leq 20$$

- She is allowed to work at most 30 hours, so:

$$x + y \leq 30$$

Finally we have the system:

$$\begin{cases} y \leq -2x + 20 \\ y \leq -x + 30 \end{cases}$$

We have to graph each of the linear function that compound the system. One easy way to graph each linear function is to find its intercepts with the axes.

- $y = -2x + 20$

$$x = 0 \rightarrow y = 20 \rightarrow (0, 20)$$

$$y = 16 \rightarrow x = 2 \rightarrow (2, 16)$$

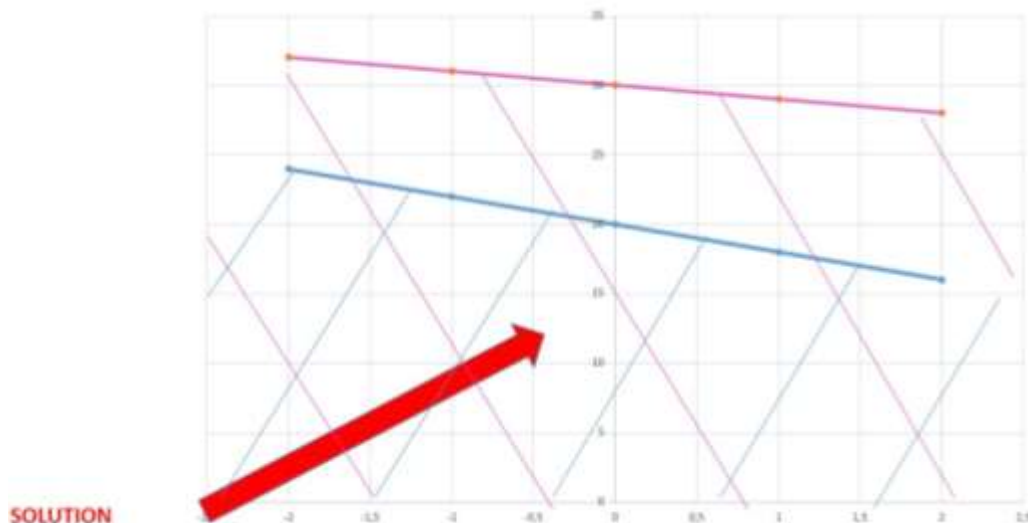
- $y = -x + 30$

$$x = 0 \rightarrow y = 30 \rightarrow (0, 30)$$

$$y = 32 \rightarrow x = -2 \rightarrow (-2, 32)$$

Graphing:

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Proving with the point (1, 10) that belongs to the solution region to verify if it satisfies the inequalities:

$$10 \leq -2(1) + 20 \rightarrow 10 < 18$$

$$10 \leq -1 + 30 \rightarrow 10 < 29$$

8. Fuel from PDV pump A costs \$4 per gallon and from PDV pump B costs \$2 per gallon. Marc has at most \$24 to spend on fuel. Write and graph a system of linear inequalities.

SOLUTION

Let's define the variables that represent the system:

X= Volume of Fuel from PDV pump A

Y= Volume of Fuel from PDV pump B

- The statement says Marc has at most \$24, so we have:

$$4x + 2y \leq 24 \rightarrow \text{simplifying} \rightarrow 2x + y \leq 12$$

- As we know the amount of fuel can never be negative, so:

$$x \geq 0 \quad \text{and} \quad y \geq 0$$

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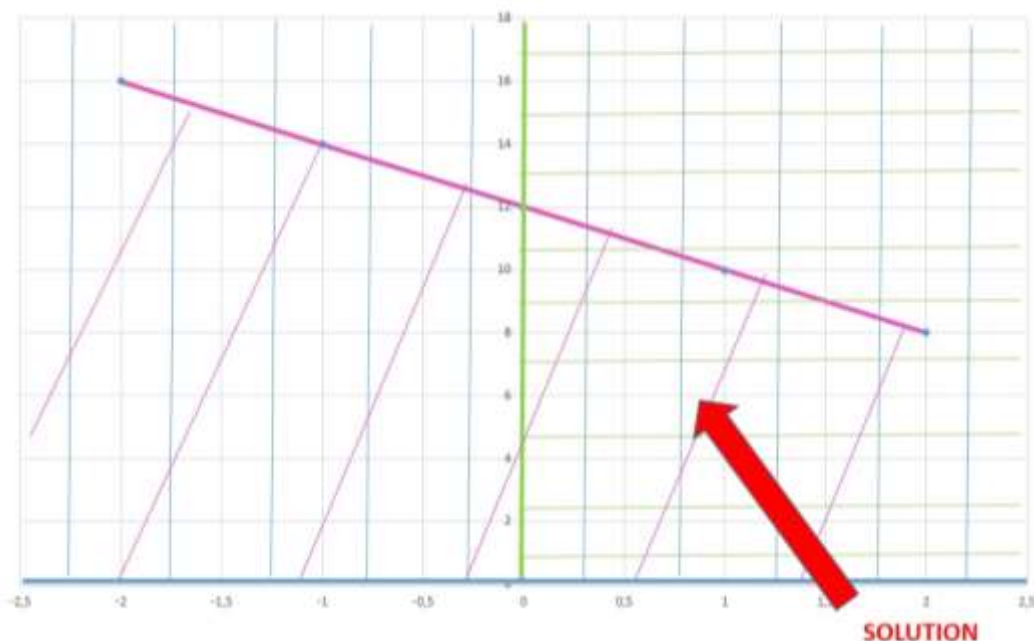
We have to graph each of the linear function that compound the system. One easy way to graph each linear function is to find its intercepts with the axes.

- $y = -2x + 12$

$$x = 0 \rightarrow y = 12 \rightarrow (0, 12)$$

$$y = 8 \rightarrow x = 2 \rightarrow (2, 8)$$

Graphing:



Proving with the point (1, 2) that belongs to the solution region to verify if it satisfies the inequalities:

$$2 \leq -2(1) + 12 \rightarrow 2 < 10$$

$$y \geq 0 \rightarrow 2 \geq 0 \quad \text{and} \quad x \geq 0 \rightarrow 1 \geq 0$$