

9.2 Graphing Linear Inequalities

FM.0.2 Use geometric and algebraic techniques to solve optimization problems with and without technology.

Linear Inequality - inequality that involves a linear function ($<$, $>$, \leq , \geq)

Geometric Optimization - Finding minimized or maximized solutions to a linear programming problem using graphs.

Ex. 1 Graphing Linear Inequalities Given the following equation, graph the linear inequality on the graph.

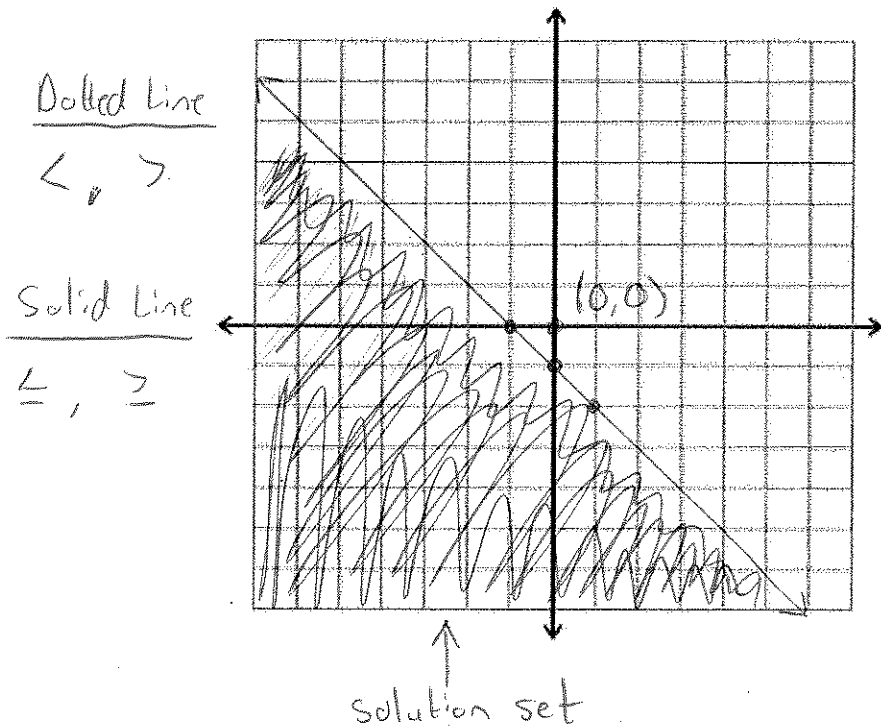
$$2x + 2y \leq -2$$

Step 1: Put inequality into slope-intercept form

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

Step 2: Graph the inequality & Step 3: Determine solution set S

y-intercept
 $y = mx + b$
 slope



$$y \leq -x - 1$$

$$m = -1 = \frac{-1}{1} = \frac{1}{-1} \quad \text{rise over run}$$

$$b = -1 \quad (0, -1)$$

Test for Shade (TFS)

$$(0, 0) \rightarrow 0 \leq -0 - 1$$

$$0 \leq -1 \quad \text{not true}$$

shade on side opposite (0,0)

Ex. 2 Graphing Linear Inequalities Given the following equation, graph the linear inequality on the graph.

$$x - 2y > 0$$

Step 1: Put inequality into slope-intercept form

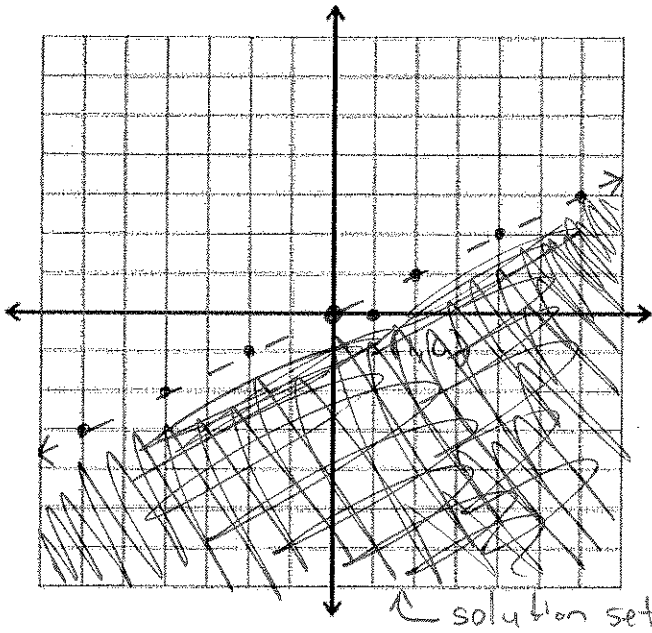
$$\frac{x - 2y > 0}{-x \quad -x}$$

$$\frac{-2y > -x}{-2 \quad -2}$$

$$y < \frac{1}{2}x$$

Flip Sign if multiply/divide by negative

Step 2: Graph the inequality & Step 3: Determine solution set S



$$y < \frac{1}{2}x$$

$$m = \frac{1}{2} = \frac{-1}{-2} \quad \begin{matrix} \text{rise} \\ \text{run} \end{matrix}$$

$$b = 0 \quad (0, 0)$$

TFS

$$(1, 0) \rightarrow 0 < \frac{1}{2}(1) \\ 0 < \frac{1}{2} \checkmark$$

Ex. 3 Sketch the solution set for the system

$$x \geq 0 \quad y \geq 0 \quad x + y - 6 \leq 0$$

vertical line horizontal line

~~$$2x + y - 8 \leq 0$$~~

$$-2x + y + 5 \leq 0$$

Step 1: Put inequalities into slope-intercept form

$$\frac{x + y - 6 \leq 0}{-x \quad +6 \quad -x + 6}$$

$$y \leq -x + 6$$

$$\frac{2x + y - 5 \leq 0}{-2x \quad -5 \quad -2x - 5}$$

$$y \leq 2x - 5$$

Step 2: Graph the inequality & Step 3: Determine solution set

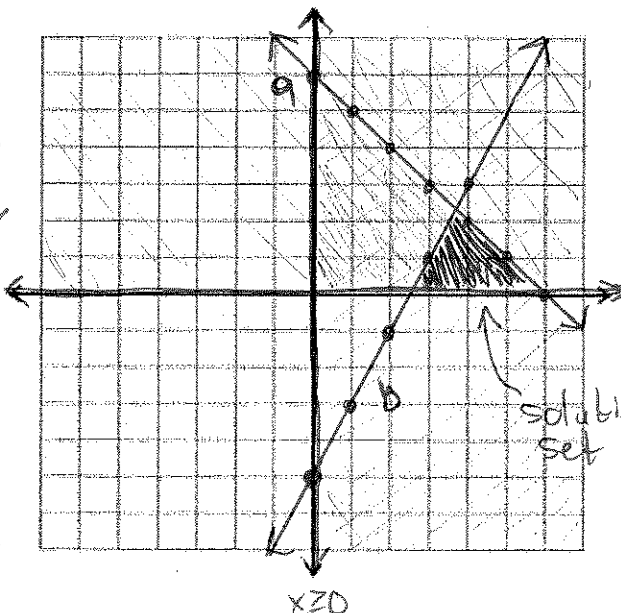
1. Graph

$$x \geq 0, y \geq 0$$

TFS
120
✓

$$120 \checkmark$$

$$y \geq 0$$



Line a
 $y \leq -x + 6$

$$m = -1 = \frac{-1}{1} \\ b = 6 \quad (0, 6)$$

TFS

$$(0, 0) \\ 0 \leq -0 + 6 \quad 0 \leq 6 \checkmark$$

Line b
 $y \leq 2x - 5$

$$m = 2 = \frac{2}{1} \\ b = -5 \quad (0, -5)$$

TFS

$$(0, 0) \\ 0 \leq 2(0) - 5 \\ 0 \leq -5 \quad \times$$