

Section 5.2 – Linear Inequalities

Graphing a Linear Inequality

Step 1: Graph the linear inequality equation. Use a **solid line** for \leq or \geq , and a **dashed line** for $<$ or $>$

Step 2: We can use either of the equation we have learned to graph the inequality

Method 1:

Choose a test point **not** on the line and substitute the point into the equation. If the inequality stays true, shade the region including that point. If not true, shade the other region

Method 2:

Algebraically manipulate to

Look at the inequality equation; if y is *greater than or equal too*, graph the upper half of the grid, if y is *less than*, graph the lower half.

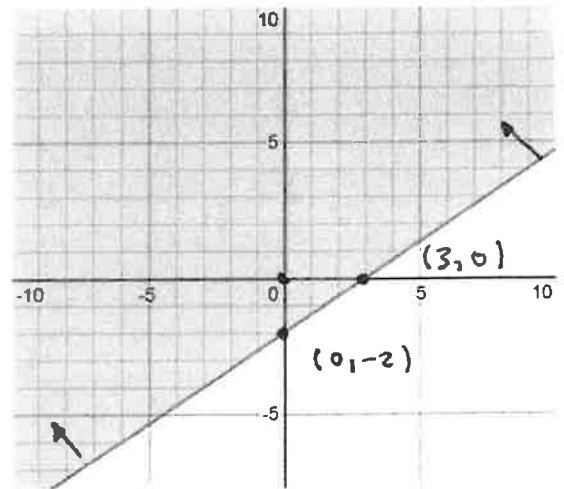
Example 1: $2x - 3y \leq 6$

Method 1:

Graph Boundary Line

x	y
0	-2
3	0

 $2x - 3y = 6$
 Choose Test Point $(0,0)$
 $2x - 3y \leq 6$
 $2(0) - 3(0) \leq 6$
 $0 \leq 6$ True \therefore shade that side



Method 2:

$2x - 3y \leq 6$
 $-3y \leq -2x + 6$
 $\frac{-3y}{-3} \leq \frac{-2x}{-3} + \frac{6}{-3}$
 $y \geq \frac{2}{3}x - 2$
 Boundary Line $y = \frac{2}{3}x - 2$
 Shade above since \geq

Divide
by
Negative

Practice Questions #1,2,5,6,7,8

Solve Systems of Linear Inequalities

Example 1:

Solve

$$2x - y > 3$$

$$x + y \geq 3$$

$$2x - y > 3$$

$$-y > -2x + 3$$

$$\frac{-y}{-1} > \frac{-2x}{-1} + \frac{3}{-1}$$

$$y < 2x - 3$$

Boundary line

$$y = 2x - 3$$

Dashed line

Shade below

$$x + y \geq 3$$

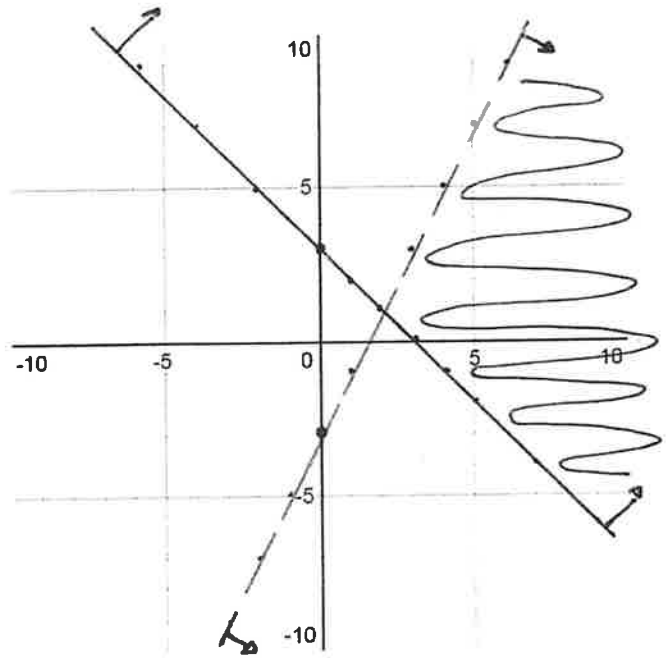
$$y \geq -x + 3$$

Boundary line

$$y = -x + 3$$

Solid line

Shade above



Example 2:

Graph the system of linear inequalities

$$3x + 2y \leq 6$$

$$x - 2y > 4$$

$$3x + 2y \leq 6$$

$$2y \leq -3x + 6$$

$$\frac{2y}{2} \leq \frac{-3x}{2} + \frac{6}{2}$$

$$y \leq -\frac{3}{2}x + 3$$

Boundary Line

$$y = -\frac{3}{2}x + 3$$

Solid line

Shade below

$$x - 2y > 4$$

$$-2y > -x + 4$$

$$\frac{-2y}{-2} > \frac{-x}{-2} + \frac{4}{-2}$$

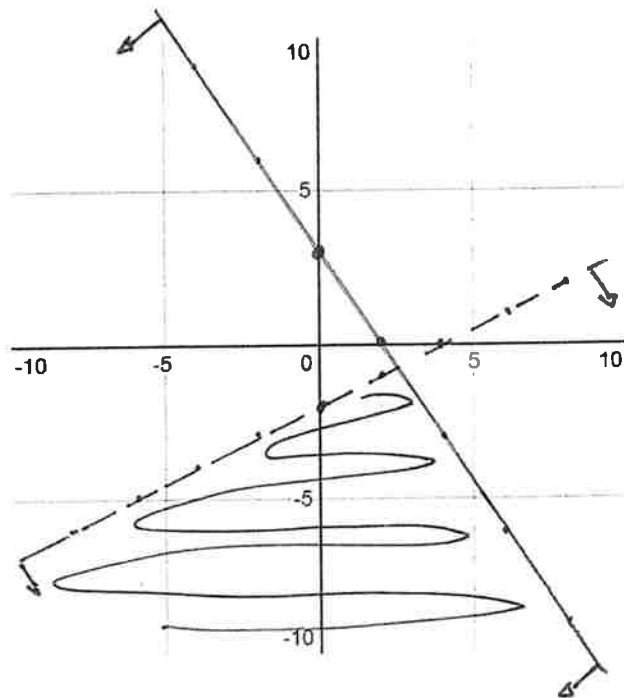
$$y < \frac{1}{2}x - 2$$

Boundary Line

$$y = \frac{1}{2}x - 2$$

dashed line

shade below



Practice Questions #10,11,12

Example 3:

Graph the system of linear inequalities

$$y > 2x - 4$$

$$x + 6y \leq 15$$

$$x \geq -3$$

$$y > -4$$

$$y > 2x - 4$$

Boundary line

$$y = 2x - 4$$

Dashed line

Shade above

$$x \geq -3$$

Boundary line

$$x = -3$$

Solid line

Shade right

$$y > -4$$

Boundary line

$$y = -4$$

Dashed

Shade above

$$x + 6y \leq 15$$

$$6y \leq -x + 15$$

$$\frac{6y}{6} \leq \frac{-x}{6} + \frac{15}{6}$$

$$y \leq -\frac{1}{6}x + \frac{15}{6}$$

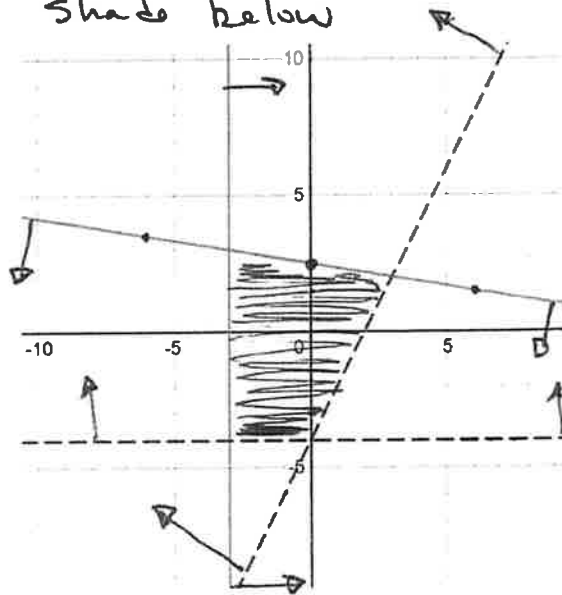
$$y \leq -\frac{1}{6}x + 2.5$$

Boundary line

$$y = -\frac{1}{6}x + 2.5$$

Solid line

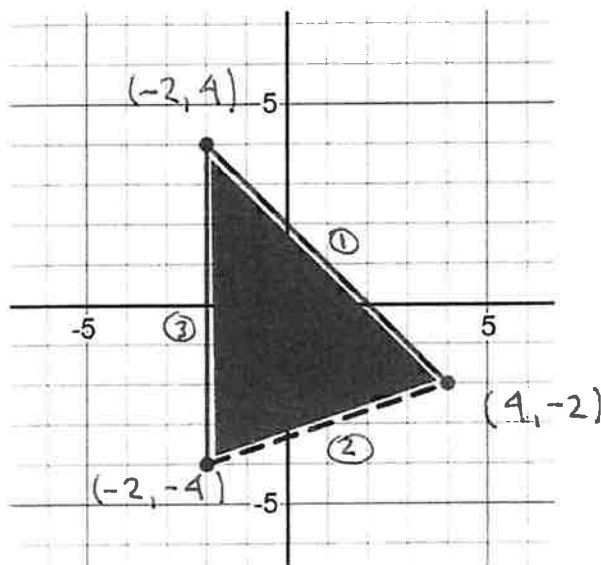
Shade below



Practice Problems

13-16

Example 4: Write a system of linear inequalities that has the given graph



$$y \leq -x + 2$$

$$y > \frac{1}{3}x - \frac{10}{3}$$

$$x \geq -2$$

$$\begin{aligned} \textcircled{1} \quad m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{4 - (-2)}{-2 - 4} \\ &= -1 \end{aligned}$$

$$y = mx + b$$

$$4 = -1(-2) + b$$

$$2 = b$$

$$\therefore y = -1x + 2$$

solid & below

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

$$\begin{aligned} \textcircled{2} \quad m &= \frac{y_2 - y_1}{x_2 - x_1} \\ &= \frac{-2 - (-4)}{4 - (-2)} \\ &= \frac{1}{3} \end{aligned}$$

$$y = mx + b$$

$$-2 = \frac{1}{3}(4) + b$$

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

$$-\frac{6}{3} - \frac{4}{3} = b$$

$$b = -\frac{10}{3}$$

$$\therefore y = \frac{1}{3}x - \frac{10}{3}$$

dashed & above

$$y > \frac{1}{3}x - \frac{10}{3}$$

③ vertical line

$$x = -2$$

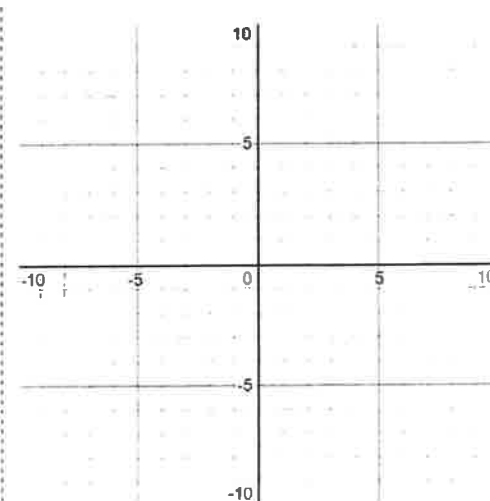
solid & to the right

$$\therefore x \geq -2$$

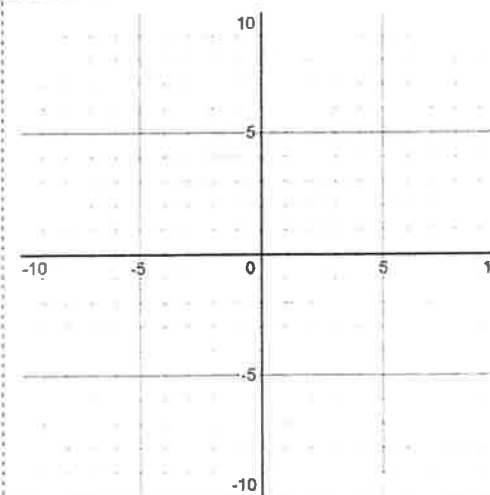
Section 5.2 – Practice Questions

Graph the following inequalities on the grid provided.

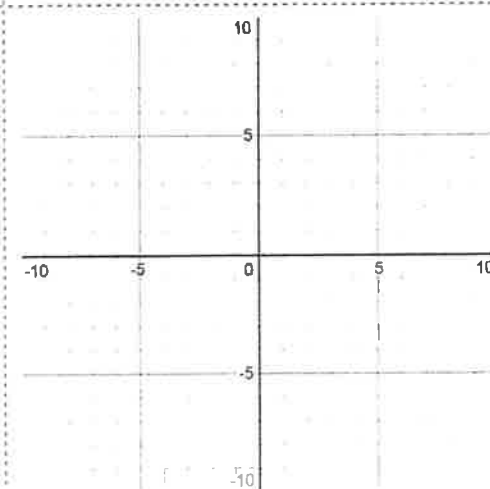
1. $3x + y \geq 6$



2. $2x - y < 4$

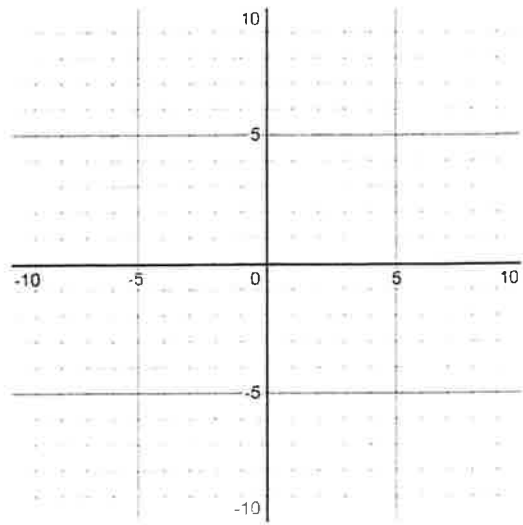


3. $0.4x - \frac{2}{3}y > 2$

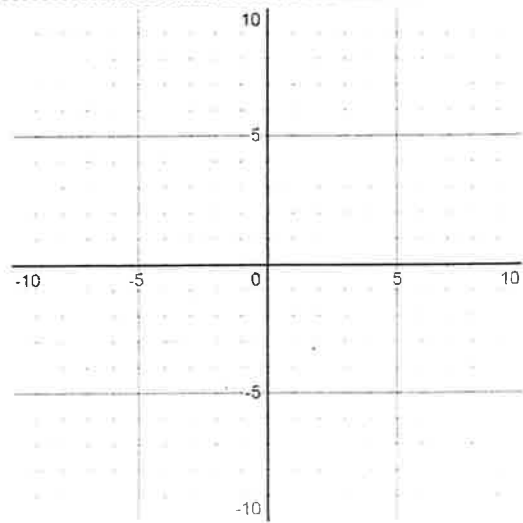


Foundations of Math 11

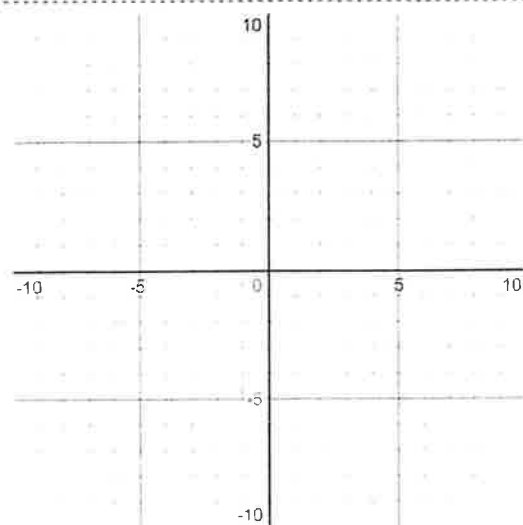
4. $\frac{1}{3}x + \frac{2}{3}y \geq 2$



5. $y \geq \frac{1}{2}x + 3$

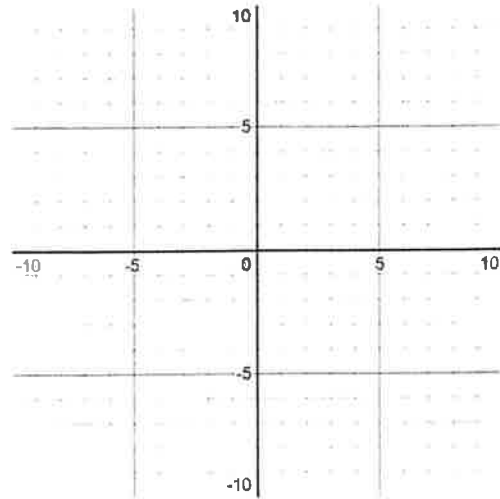


6. $y < -\frac{4}{3}x + 2$

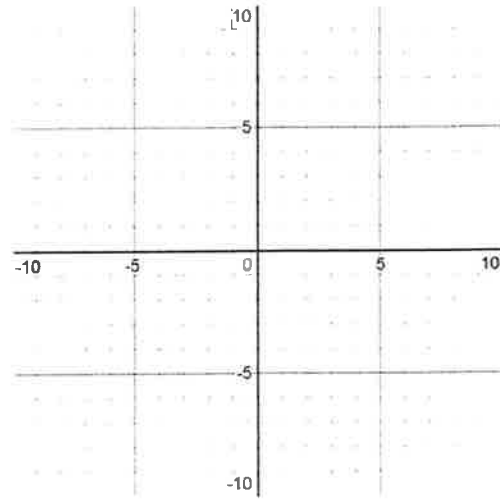


Foundations of Math 11

7. $x < 2$

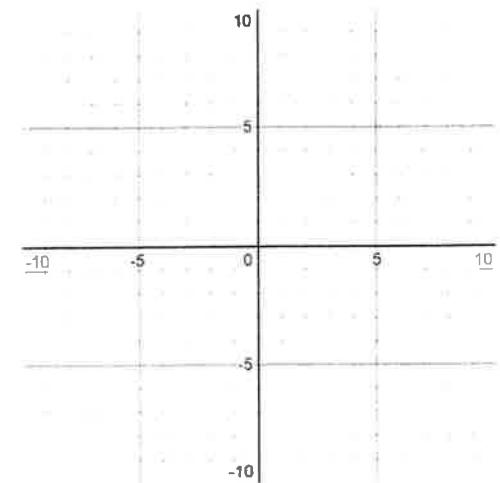


8. $y > -3$

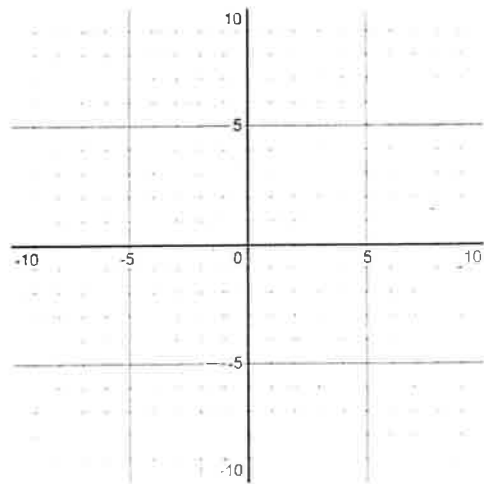


Graph the following inequalities on the grid provided and shade in the solution.

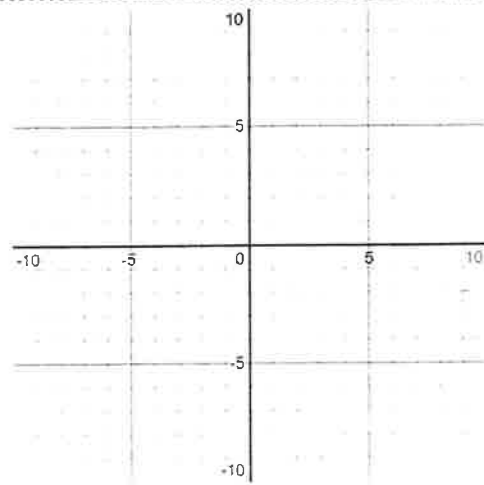
9. $y \geq x$
 $2y < -x + 2$



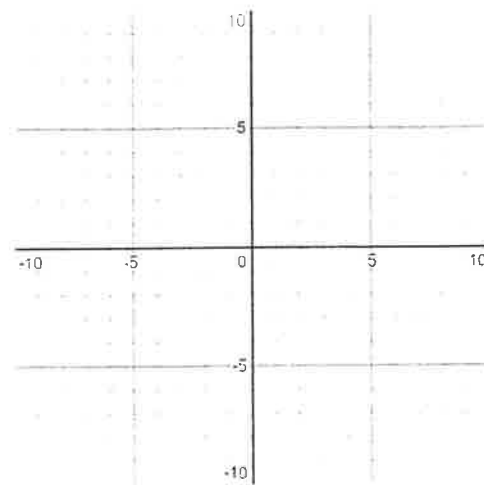
10. $x + 2y > 4$
 $3x - 2y \leq 6$



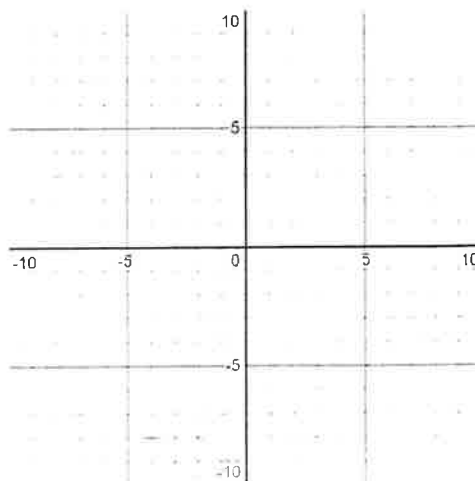
11. $x + y \leq 2$
 $x + y \geq -2$



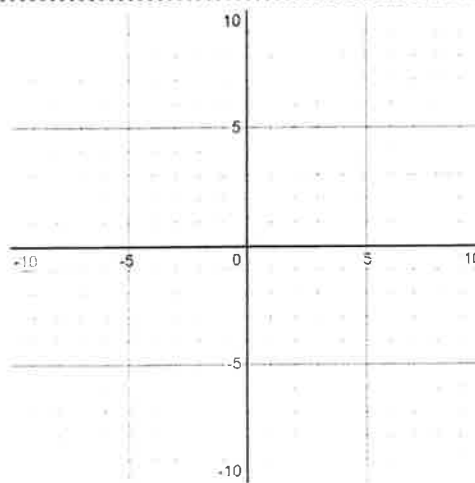
12. $y \leq x + 1$
 $y \geq -x + 1$



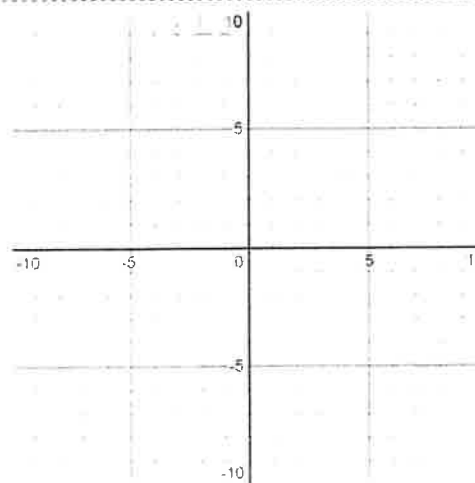
13. $4x + 5y < 20$
 $2x - y \leq 4$
 $x \geq 0$
 $y \geq 0$



14. $x - y \leq 1$
 $x - y \geq -3$
 $-1 \leq x \leq 3$

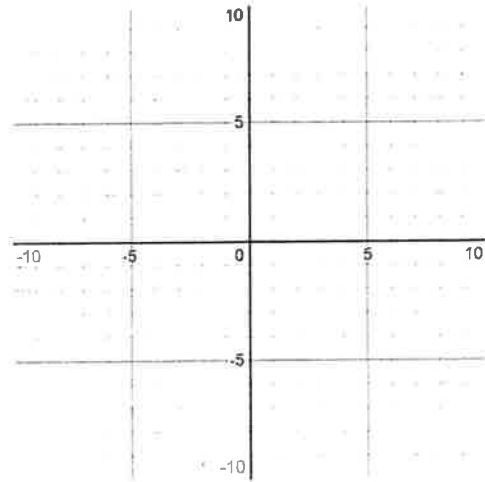


15. $x - y \leq 2$
 $x + 2y \leq 4$
 $x \leq -1$



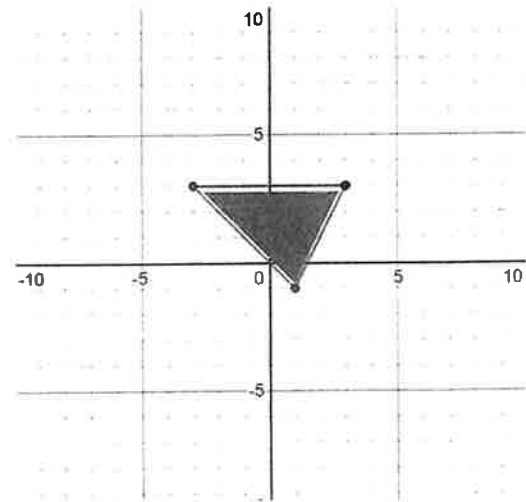
Foundations of Math 11

16. $x + y \leq 4$
 $2x - y \geq 2$
 $x \geq 0$
 $y \geq 0$

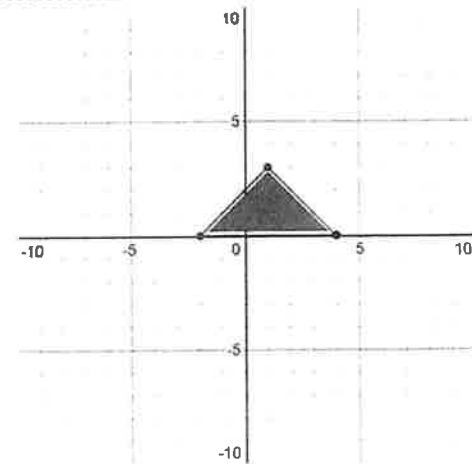


Write a system of linear inequalities that forms the given graph

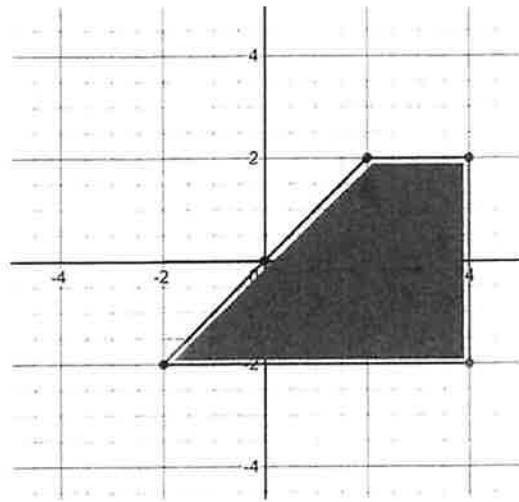
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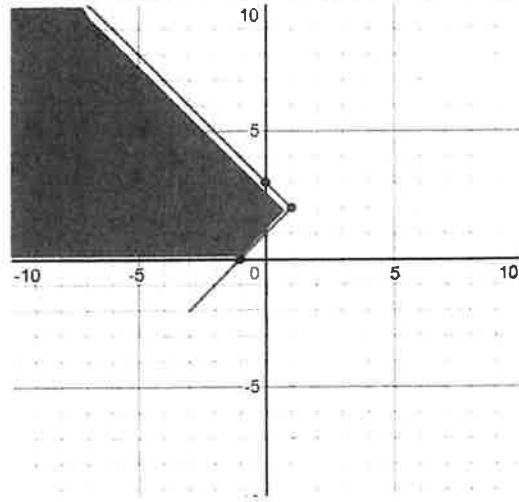
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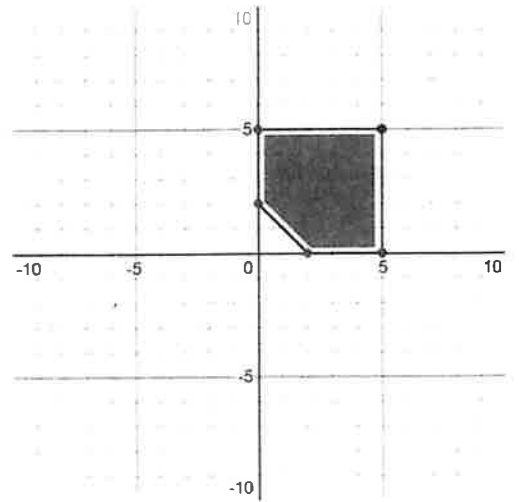
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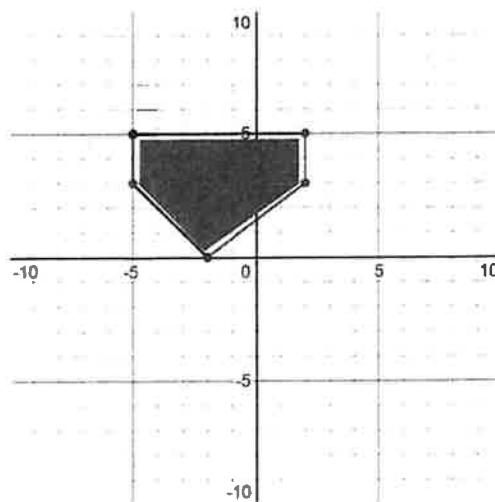
20.



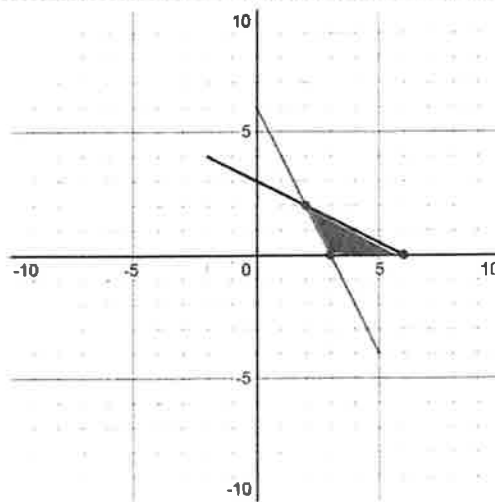
21.



22.



23.



24.

