

INEQUALITIES

[CONTENTS](#)

Worked example

List the integers that satisfy:

$$-4 < x < 4:$$

$$-4 \leq x \leq 4:$$

$$-4 < x \leq 4:$$

$$-4 \leq x < 4:$$

Your turn

List the integers that satisfy:

$$-3 < y \leq 2$$

$$\{-2, 1, 0, 1, 2\}$$

Worked example

List the integers that satisfy:

$$-3 < x < 2:$$

$$-2 \leq x \leq 3:$$

$$-4 < x \leq -1:$$

$$-4 \leq x < 0:$$

Your turn

List the integers that satisfy:

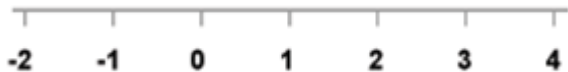
$$-7 < y \leq 2$$

$$\{-6, -5, -4, -3, -2, -1, 0, 1, 2\}$$

Worked example

Represent on a number line:

$$x < 2$$



$$x > -2$$



$$x \geq -1$$



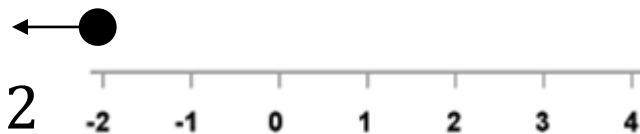
$$x \leq 1$$



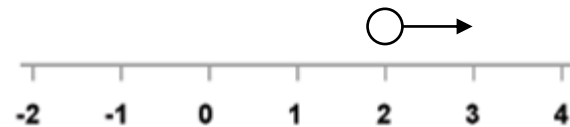
Your turn

Represent on a number line:

$$x \leq -2$$



$$x > 2$$



Worked example

Represent on a number line:

$$-1 \leq x \leq 2$$

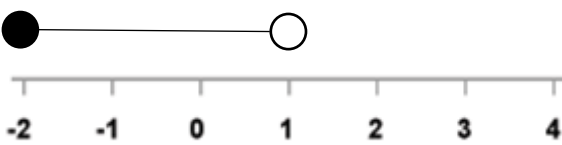

$$-1 < x < 2$$

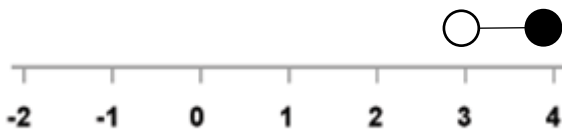

$$-1 < x \leq 2$$


$$-1 \leq x < 2$$


Your turn

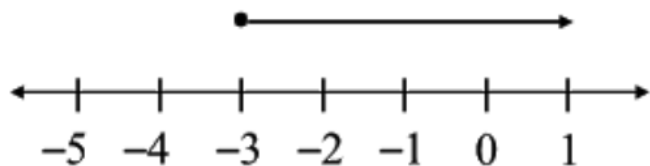
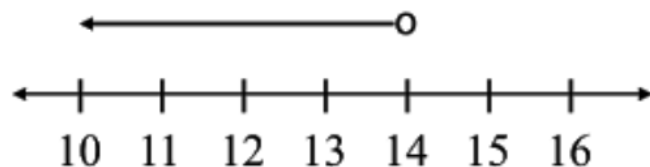
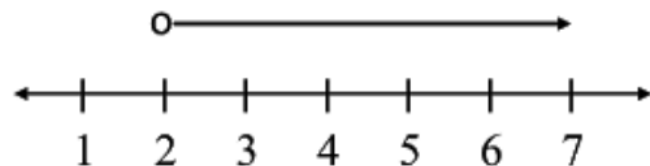
Represent on a number line:

$$-2 \leq x < 1$$


$$-3 < x \leq 4$$


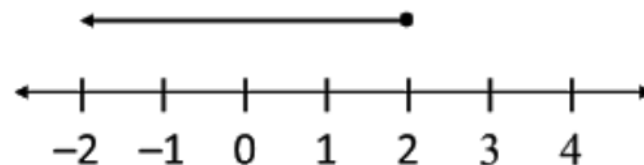
Worked example

Write down the inequality for x shown on the number line:



Your turn

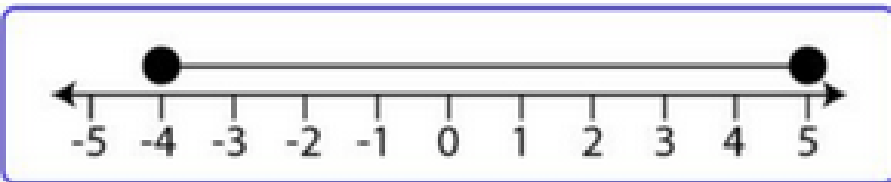
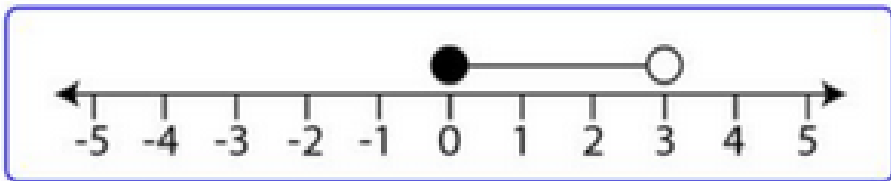
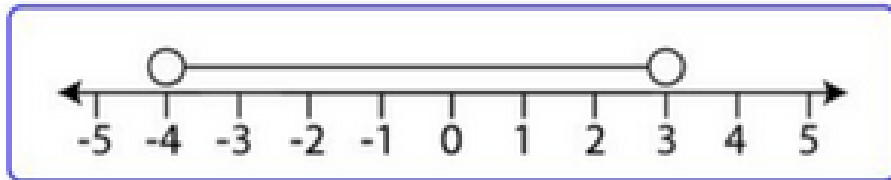
Write down the inequality for x shown on the number line:



$$x \leq 2$$

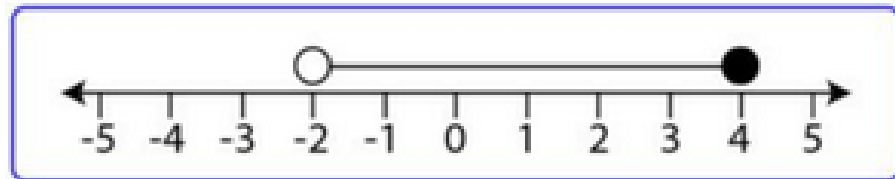
Worked example

Write down the inequality for x shown on the number line:



Your turn

Write down the inequality for x shown on the number line:



$$-2 < x \leq 4$$

Worked example

Solve:

$$3x < 12$$

$$4x - 1 > 15$$

$$11 \leq 2x - 5$$

Your turn

Solve:

$$15 \geq 3x - 6$$

$$x \leq 7$$

Worked example

Solve:

$$-x < 12$$

$$12 < -2x$$

$$16 \geq -3x + 4$$

Your turn

Solve:

$$-4x + 5 \leq 17$$

$$x \geq -3$$

Worked example

Solve:

$$5x + 2 < 3x - 4$$

$$3x + 2 \leq 5x - 4$$

$$3x + 2 > 4 - 5x$$

Your turn

Solve:

$$4x - 3 \geq 2 - x$$

$$x \geq 1$$

Worked example

Solve:

$$-8 < x + 3 \leq 2$$

$$-5 \leq x - 2 < -1$$

Your turn

Solve:

$$-7 < x + 7 < 5$$

$$-14 < x < -2$$

Worked example

Solve:

$$-8 < 2x \leq 2$$

$$-12 \leq 3x < -3$$

Your turn

Solve:

$$-4 < 4x < 20$$

$$-3 < x < 5$$

Worked example

Solve:

$$-8 < \frac{x}{2} \leq 2$$

$$-12 \leq \frac{x}{3} < -3$$

Your turn

Solve:

$$-4 < \frac{x}{4} < 20$$

$$-16 < x < 80$$

Worked example

Solve:

$$-8 < 2x - 1 \leq 2$$

$$-12 \leq 3x + 2 < -3$$

Your turn

Solve:

$$-4 < 4x - 3 < 20$$

$$-\frac{1}{4} < x < \frac{23}{4}$$

Worked example

Solve:

$$-8 < \frac{x-1}{2} \leq 2$$

$$-12 \leq \frac{x+2}{3} < -3$$

Your turn

Solve:

$$-4 < \frac{x-3}{4} < 20$$

$$-13 < x < 83$$

Worked example

A says, 'I think of a number, multiply it by 7 and then subtract 10'.

B says, 'I am thinking of the same original number, but I add 5 then multiply by 2'

If *A*'s answer is greater than *B*'s, what is the range of values they could be thinking of?

Your turn

P says, 'I think of a number, multiply it by 5 and then subtract 3'.

Q says, 'I am thinking of the same original number, but I add 2 then multiply by 3'

If *Q*'s answer is greater than *P*'s, what is the range of values they could be thinking of?

$$x < \frac{9}{2}$$

Worked example

A needs to save up for a item which will cost at least £200. *A* earns £7 per hour worked (h). Form and solve an inequality to represent how many hours *A* will need to work to pay for the item.

Your turn

B needs to save up for an item which will cost at least £300. *B* earns £6 per hour worked (h). Form and solve an inequality to represent how many hours *B* will need to work to pay for the item.

$$h \geq 50$$

Worked example

Solve:

$$x^2 - 5x + 6 = 0$$

$$x^2 - 5x + 6 < 0$$

$$x^2 - 5x + 6 \leq 0$$

Your turn

Solve:

$$x^2 - 4x + 3 < 0$$

$$1 < x < 3$$

Worked example

Solve:

$$x^2 - 5x + 6 = 0$$

$$x^2 - 5x + 6 > 0$$

$$x^2 - 5x + 6 \geq 0$$

Your turn

Solve:

$$x^2 - 4x + 3 > 0$$

$$x < 1 \cup x > 3$$

Worked example

Solve:

$$2x^2 - 7x + 3 \leq 0$$

$$2x^2 - 3x - 5 < 0$$

Your turn

Solve:

$$2x^2 - 7x + 6 \leq 0$$

$$\frac{3}{2} \leq x \leq 2$$

Worked example

Solve:

$$2x^2 + x - 6 \geq 0$$

$$2x^2 + x - 6 > 0$$

Your turn

Solve:

$$3x^2 + x - 2 \geq 0$$

$$x \leq -1 \cup x \geq \frac{2}{3}$$

Worked example

Solve:

$$x^2 + 5x + 23 \leq -3x + 8$$

$$x^2 - 14x + 57 > 2x - 3$$

Your turn

Solve:

$$x^2 + 7x + 38 < -7x - 2$$

$$-10 < x < -4$$

Worked example

Solve:

$$x^2 < 9$$

$$2x^2 \leq 8$$

Your turn

Solve:

$$x^2 < 16$$

$$-4 < x < 4$$

Worked example

Solve:

$$x^2 > 25$$

$$2x^2 \geq 2$$

Your turn

Solve:

$$x^2 > 36$$

$$x < -6 \cup x > 6$$

Worked example

Solve:

$$x^2 > 25$$

$$2x^2 \geq 2$$

Your turn

Solve:

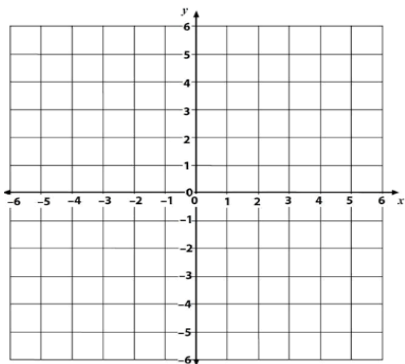
$$x^2 > 36$$

$$x < -6 \cup x > 6$$

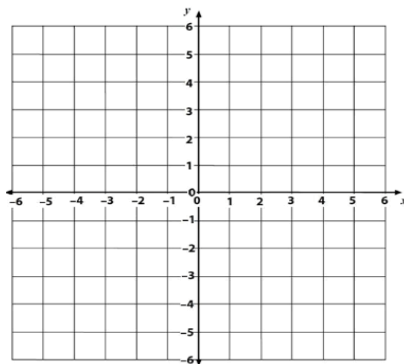
Worked example

Shade the region which satisfies the inequality:

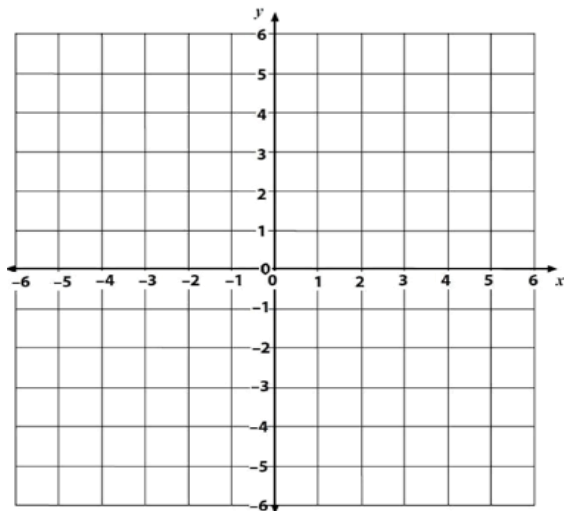
$$x > 3$$



$$x \leq -2$$

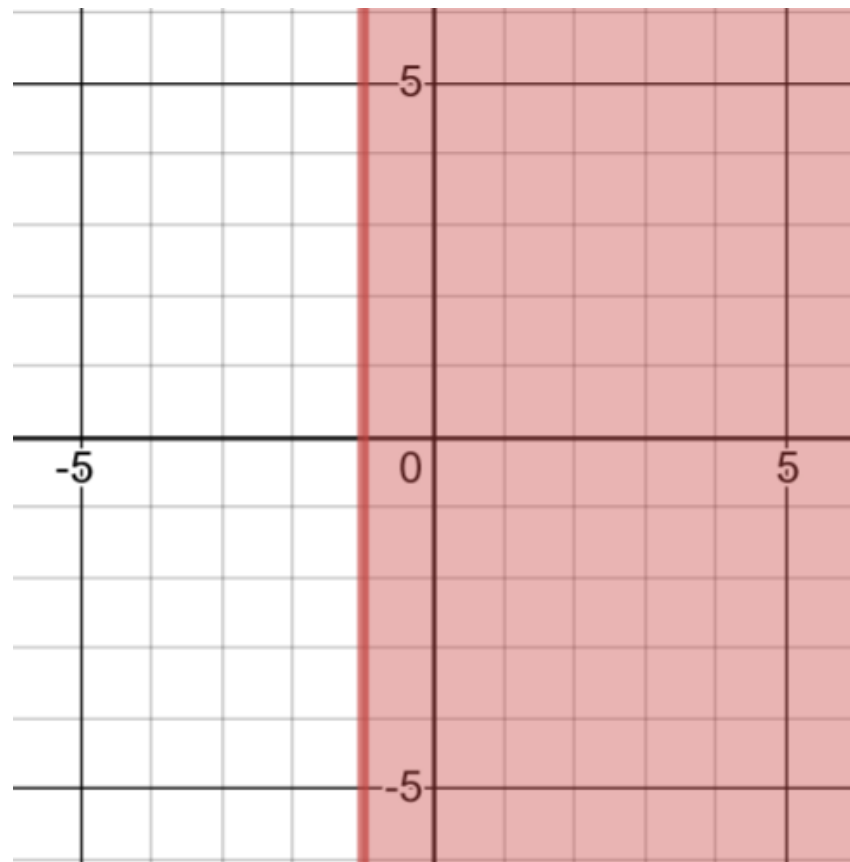


$$x < 5$$



Your turn

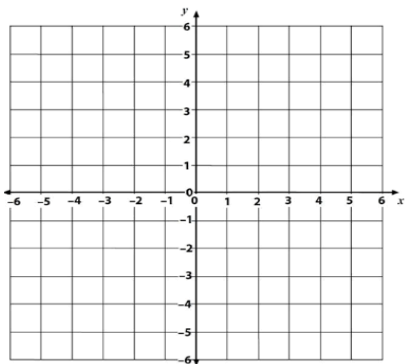
Shade the region which satisfies the inequality $x \geq -1$



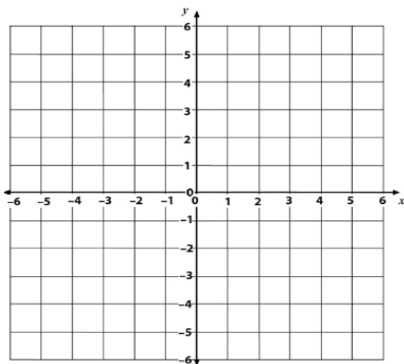
Worked example

Shade the region which satisfies the inequality:

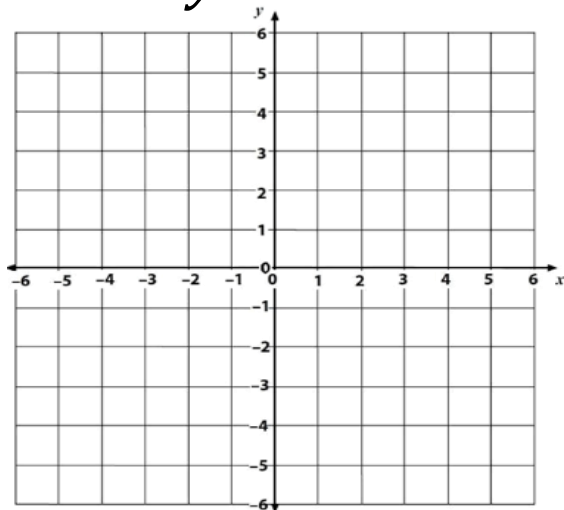
$$y > 3$$



$$y \leq -2$$

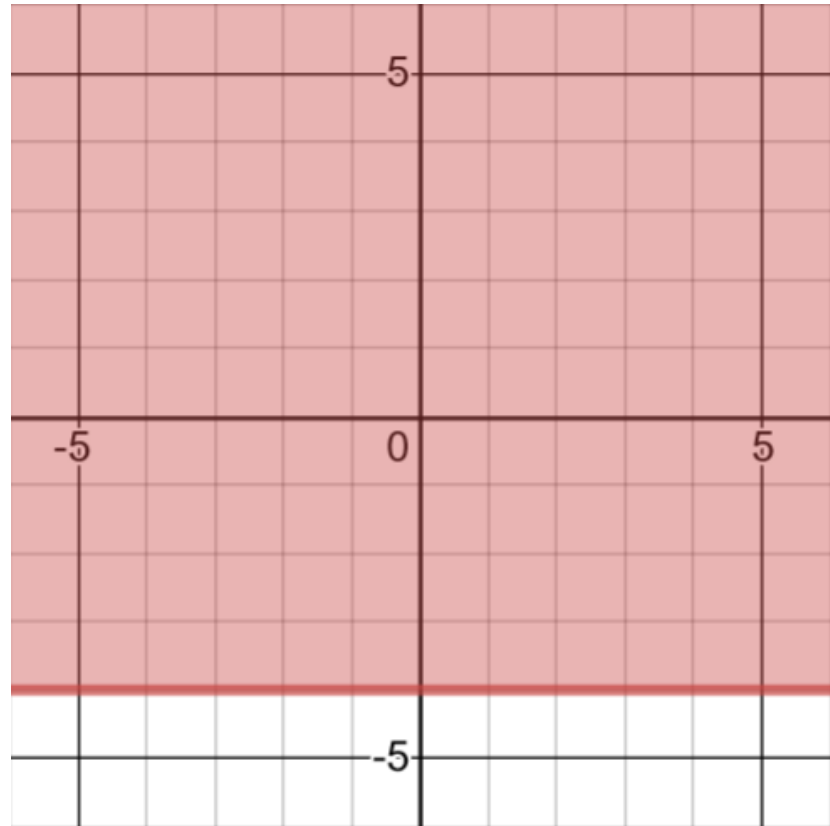


$$y < 5$$



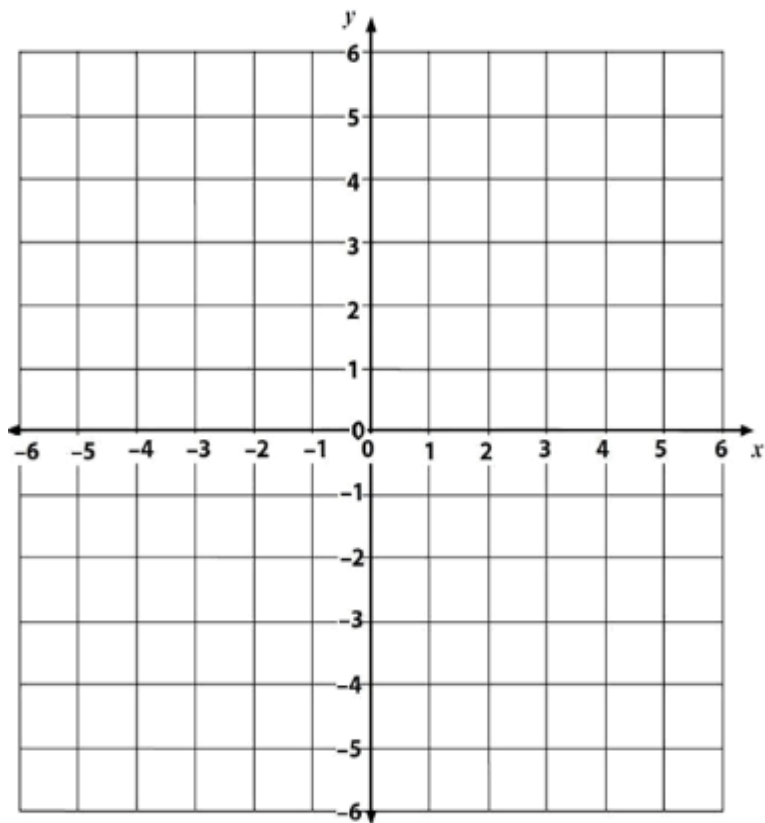
Your turn

Shade the region which satisfies the inequality $y \geq -4$



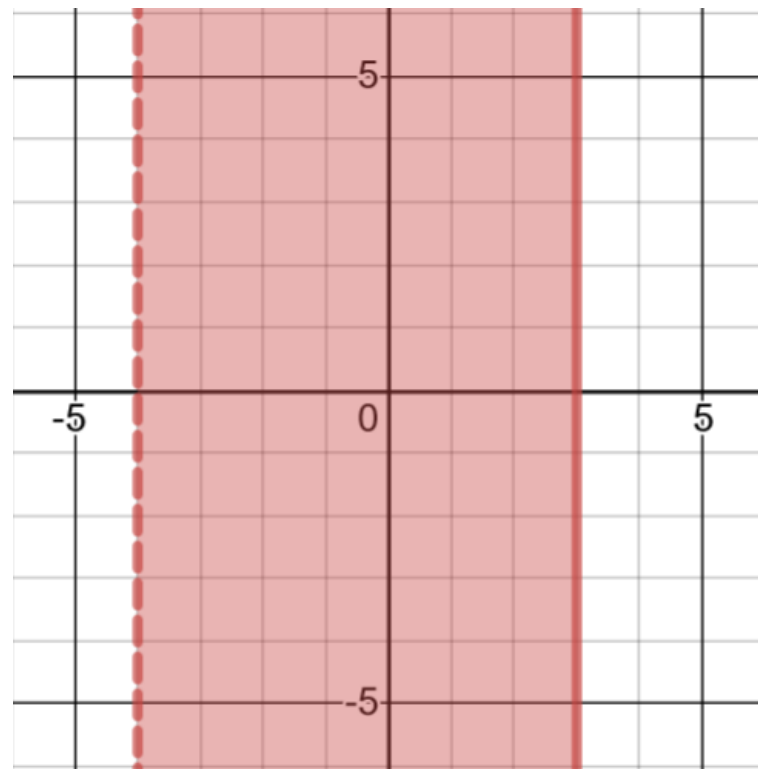
Worked example

Shade the region which satisfies the inequality $-2 \leq x < 5$



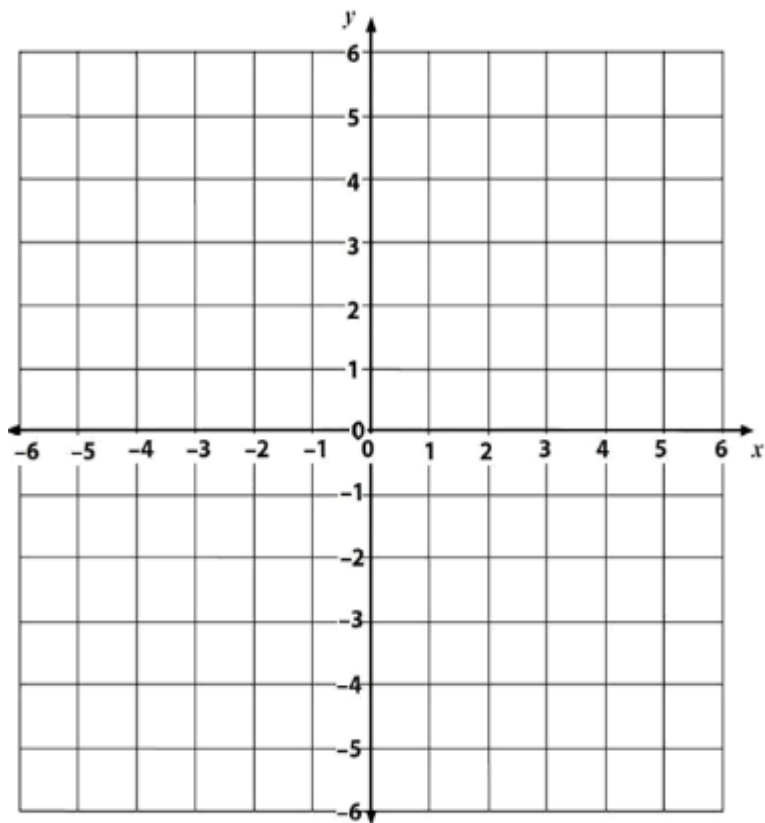
Your turn

Shade the region which satisfies the inequality $-4 < x \leq 3$



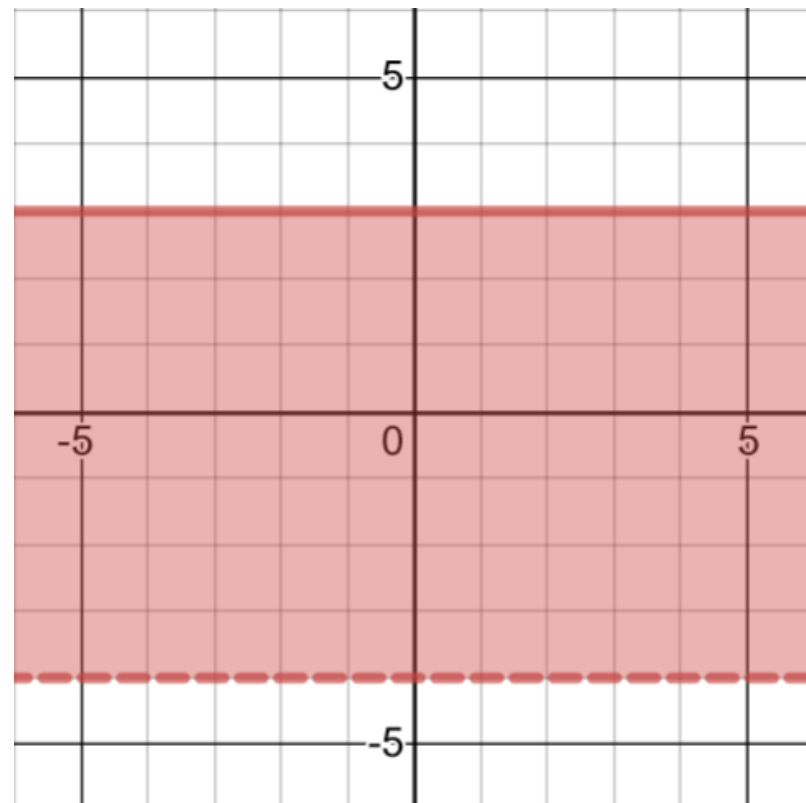
Worked example

Shade the region which satisfies the inequality $-2 \leq y < 5$



Your turn

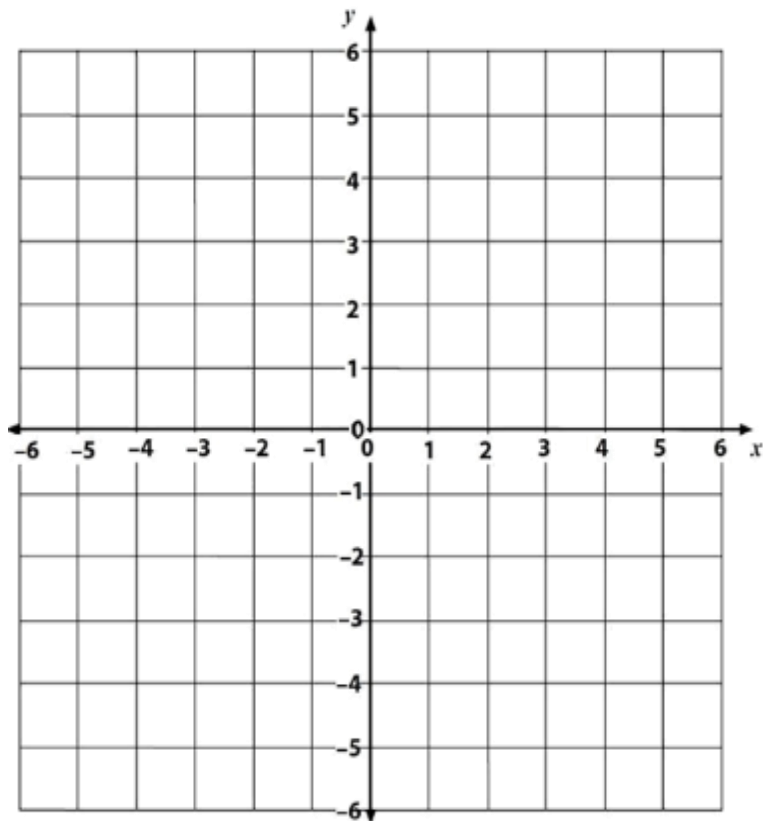
Shade the region which satisfies the inequality $-4 < y \leq 3$



Worked example

Shade the region which satisfies the inequalities. Label it R.

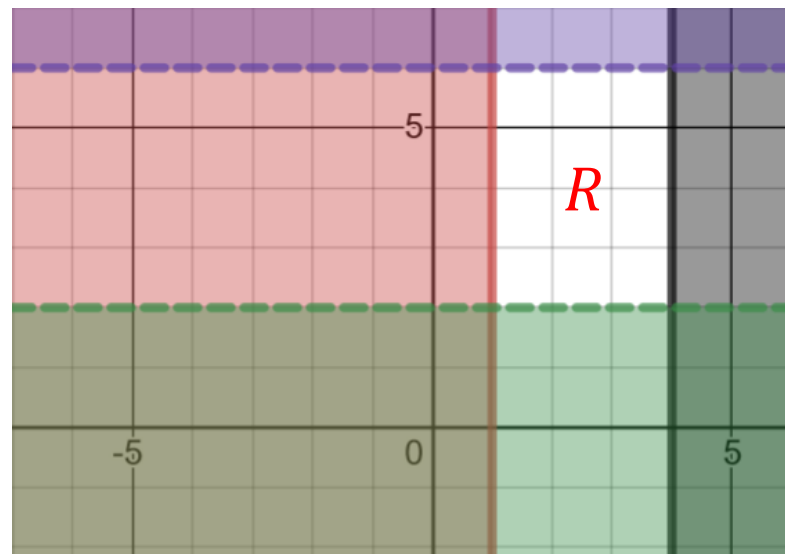
$$2 \leq x \leq 5 \text{ and } 1 < y < 3$$



Your turn

Shade the region which satisfies the inequalities. Label it R

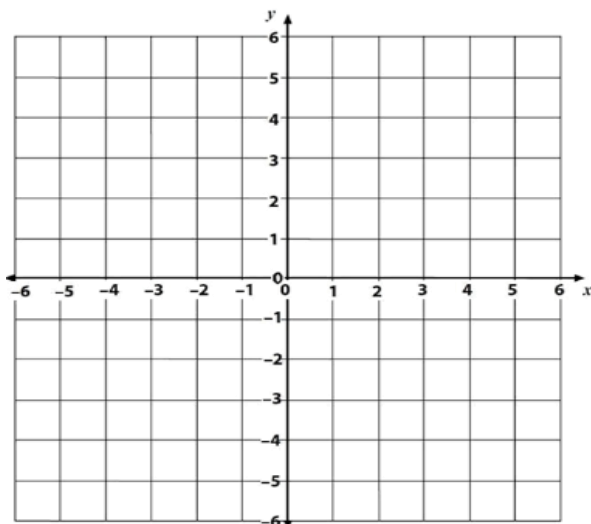
$$1 \leq x \leq 4 \text{ and } 2 < y < 6$$



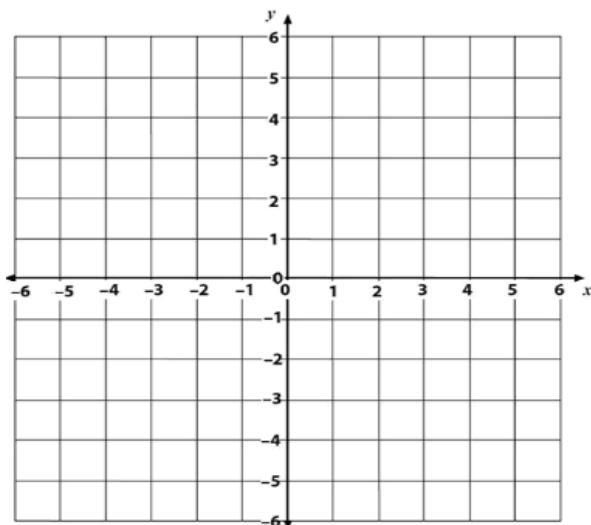
Worked example

Shade the region which satisfies the inequality:

$$y > 2x + 3$$

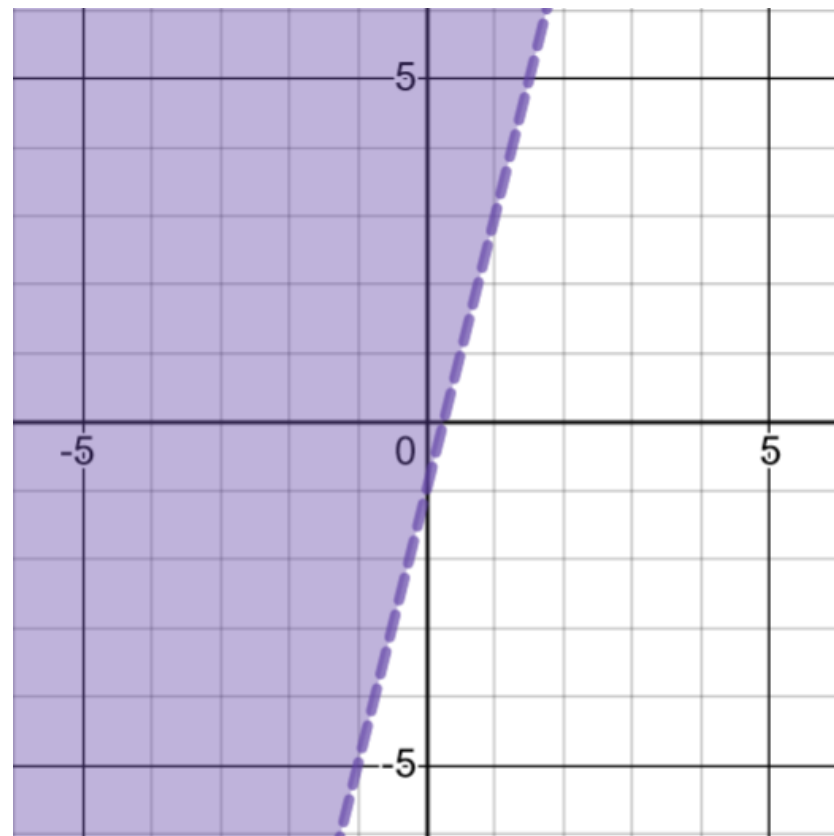


$$y \geq 3x - 2$$



Your turn

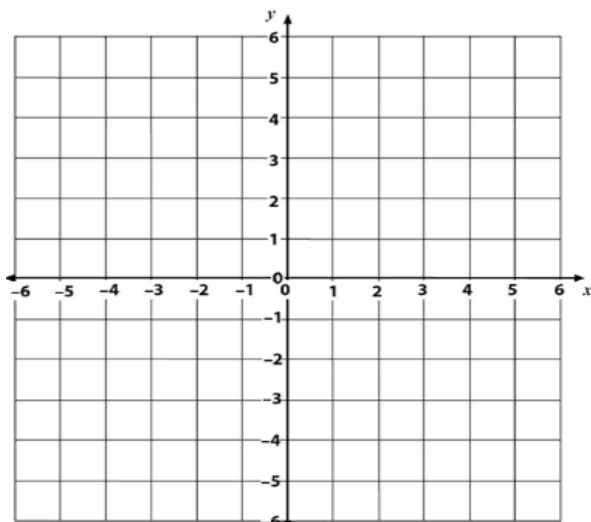
Shade the region which satisfies the inequality $y > 4x - 1$



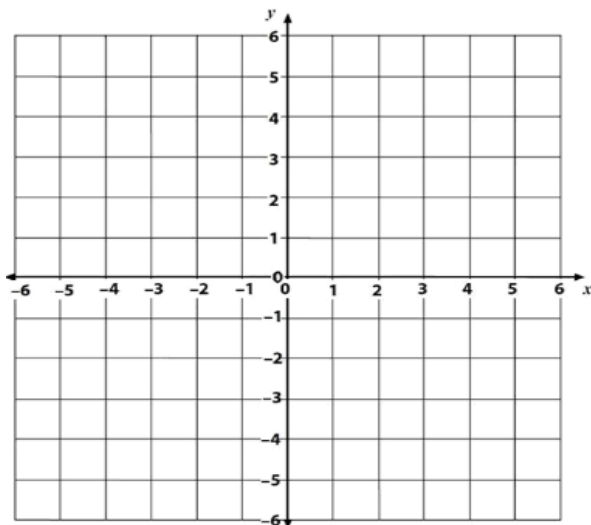
Worked example

Shade the region which satisfies the inequality:

$$y < 2x + 3$$

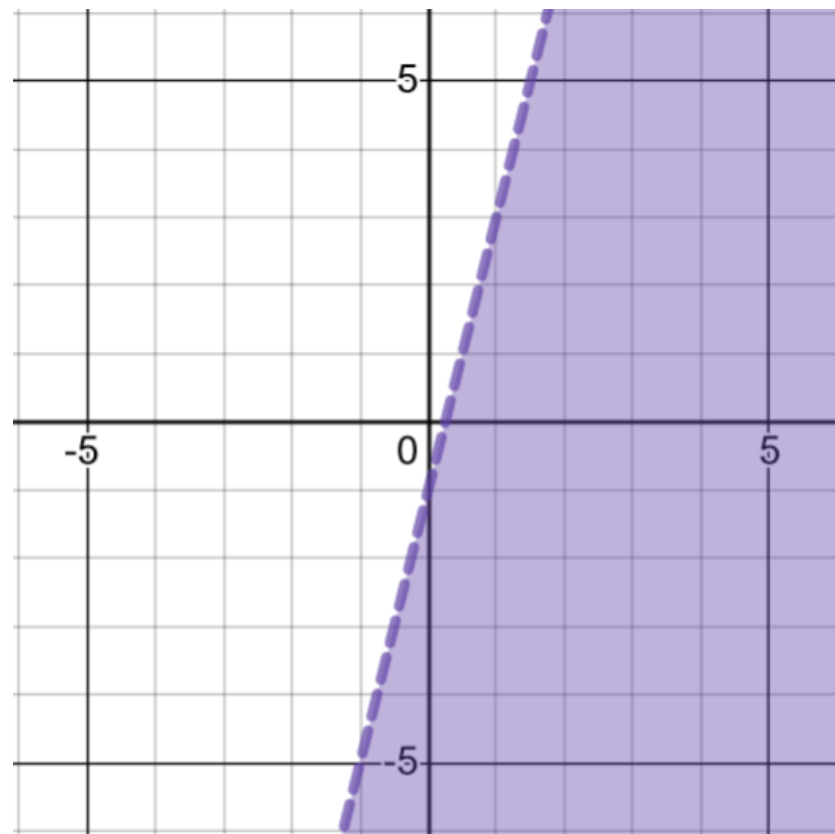


$$y \leq 3x - 2$$



Your turn

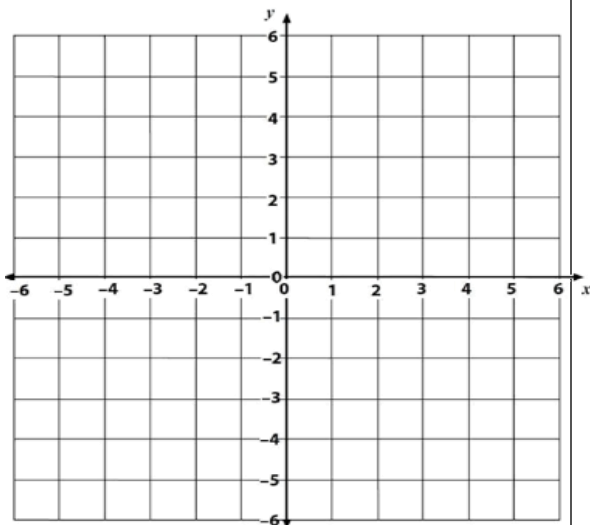
Shade the region which satisfies the inequality $y < 4x - 1$



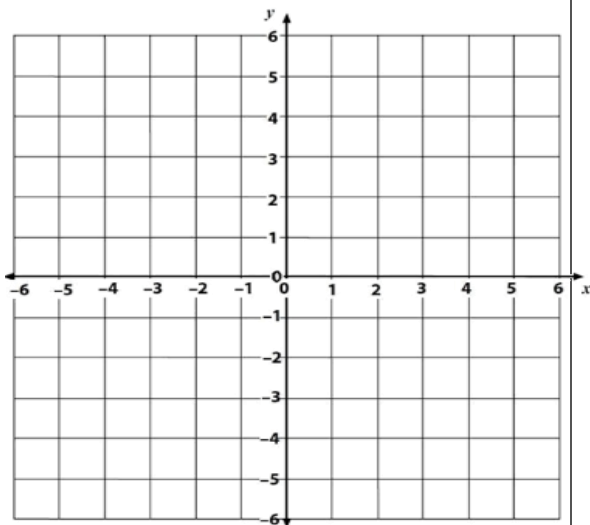
Worked example

Shade the region which satisfies the inequality:

$$y < -2x + 3$$

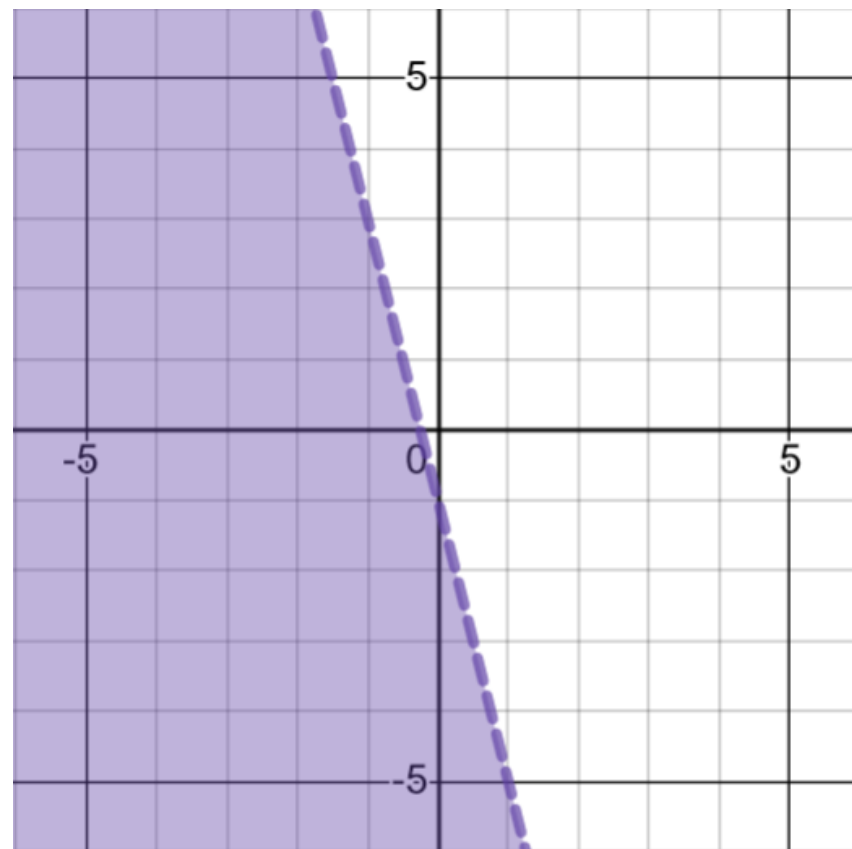


$$y \leq -2 - 3x$$



Your turn

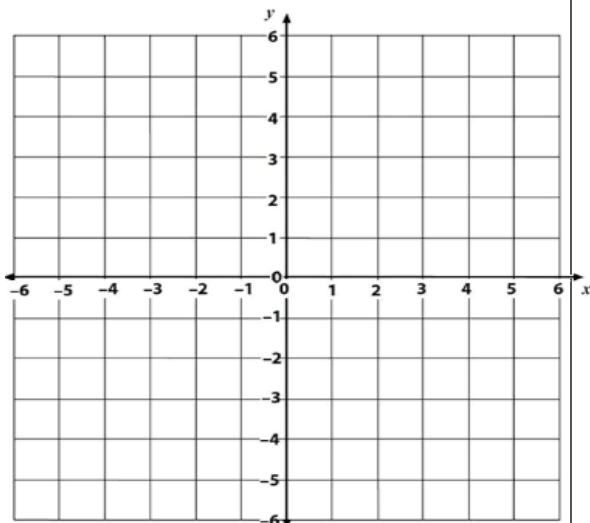
Shade the region which satisfies the inequality $y < -1 - 4x$



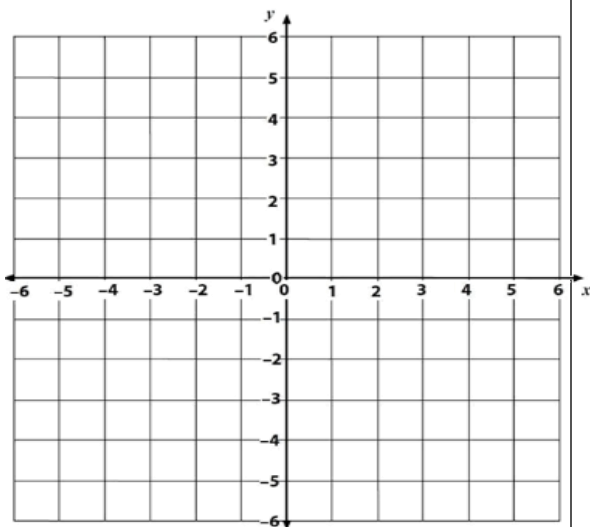
Worked example

Shade the region which satisfies the inequality:

$$y > -2x + 3$$

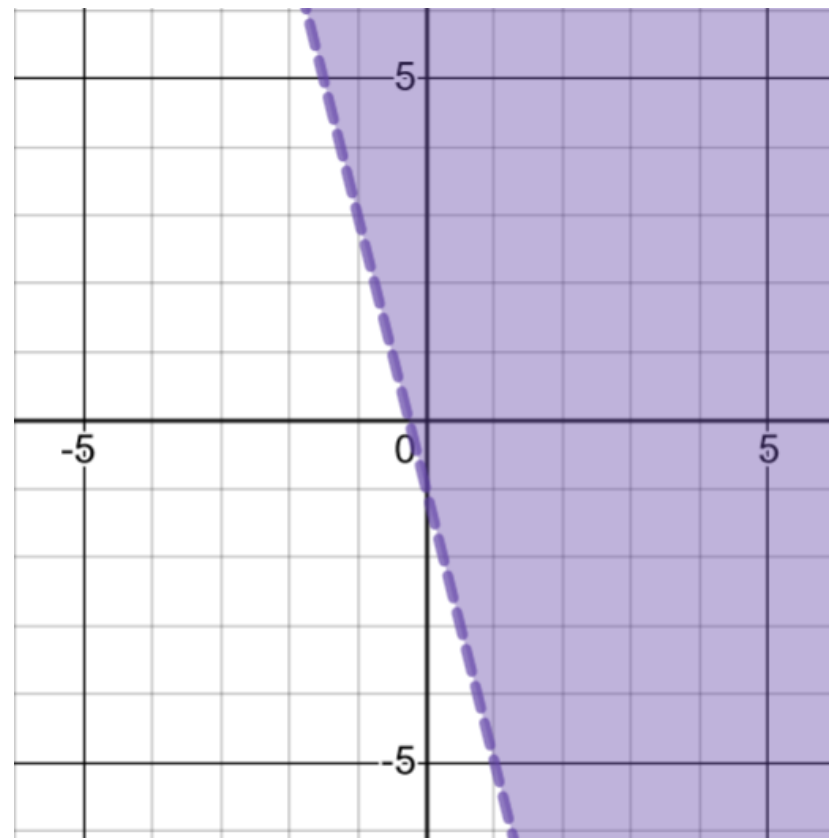


$$y \geq -2 - 3x$$



Your turn

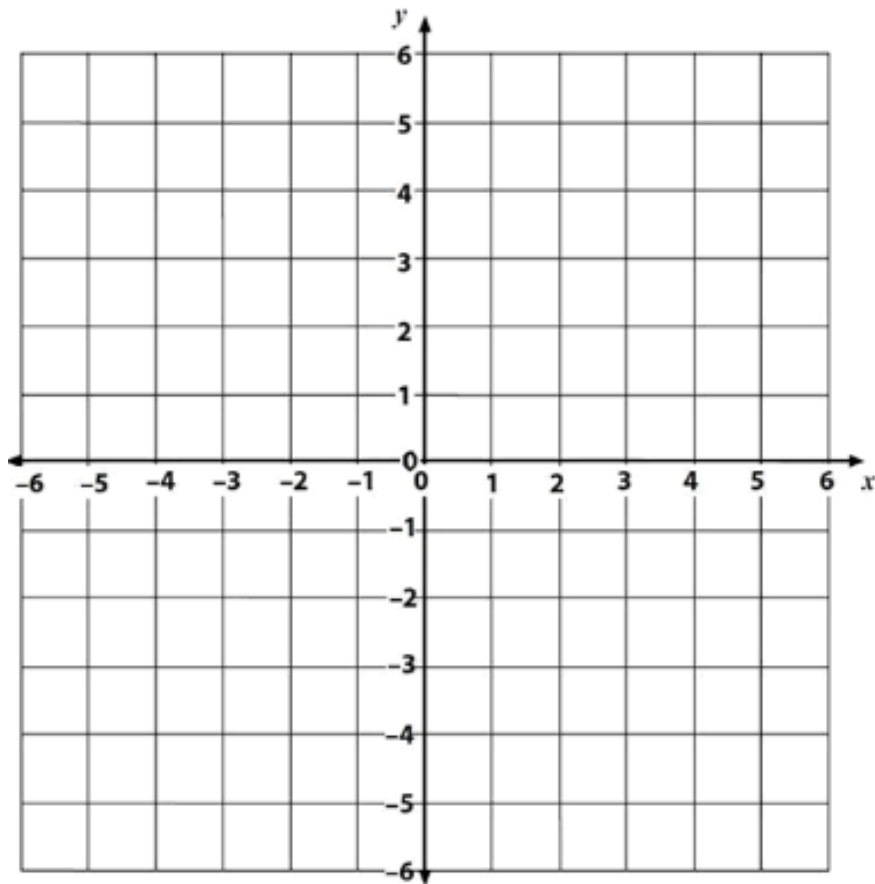
Shade the region which satisfies the inequality $y > -1 - 4x$



Worked example

Shade the region which satisfies the inequalities. Label it R

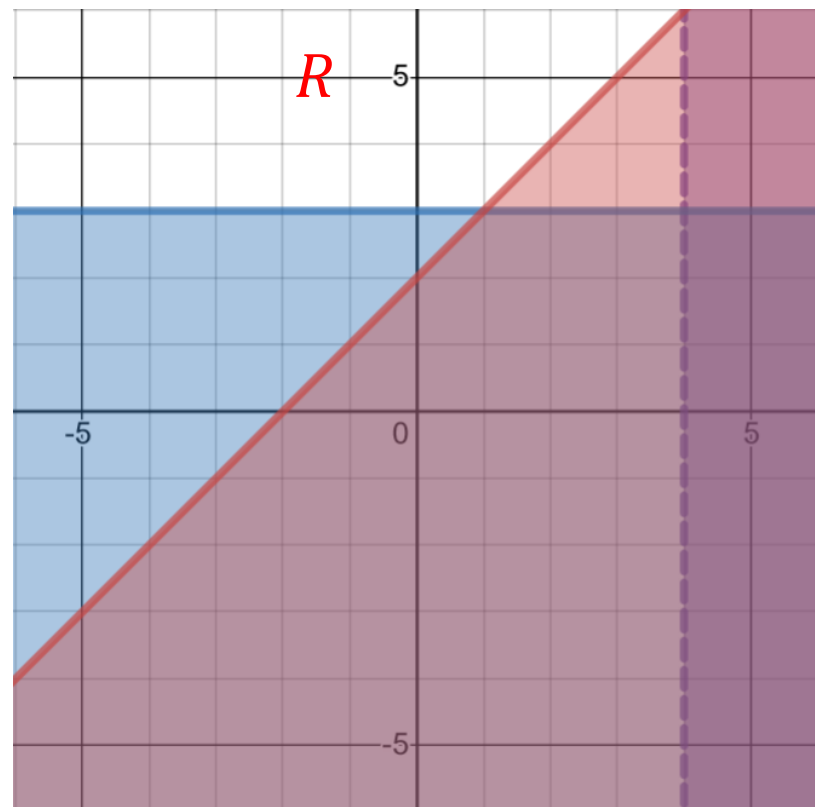
$$x \leq 3, y > 1 \text{ and } y \geq x + 3$$



Your turn

Shade the region which satisfies the inequalities. Label it R.

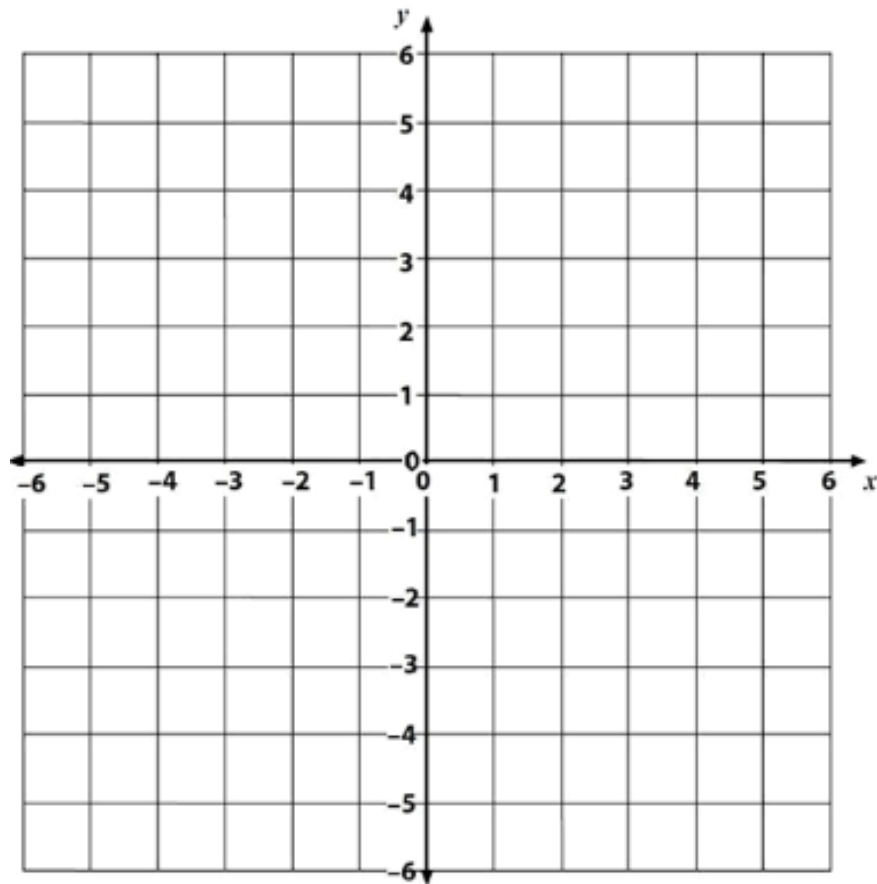
$$x < 4, y \geq 3, y \geq x + 2$$



Worked example

Shade the region which satisfies the inequalities:

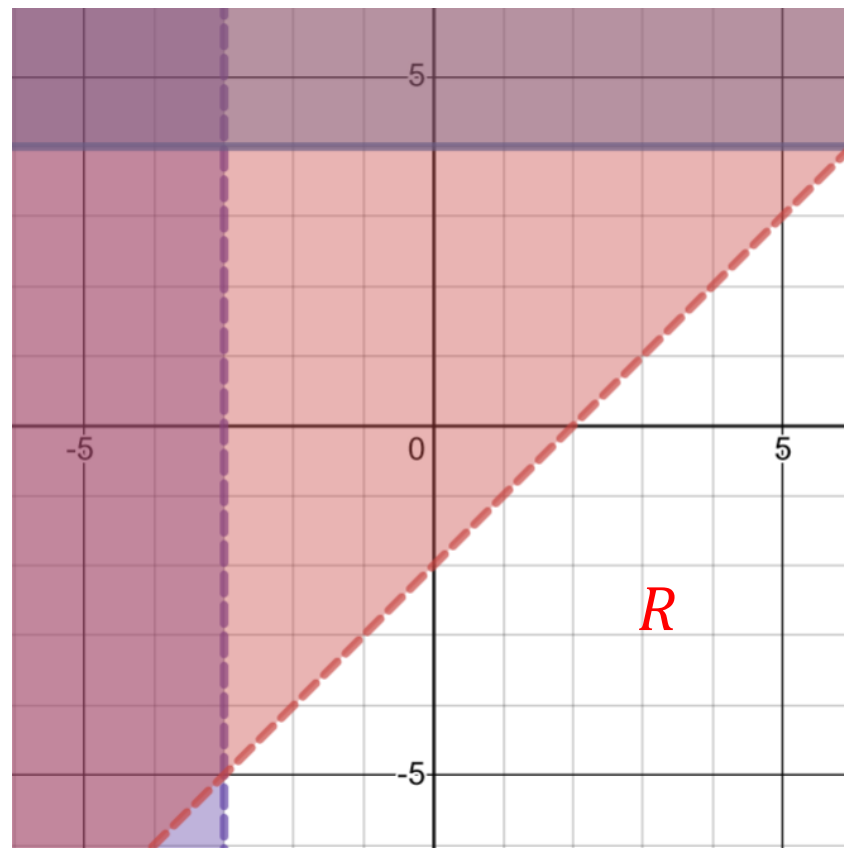
$$x \geq -2, y < 1 \text{ and } y < x - 1$$



Your turn

Shade the region which satisfies the inequalities. Label it R.

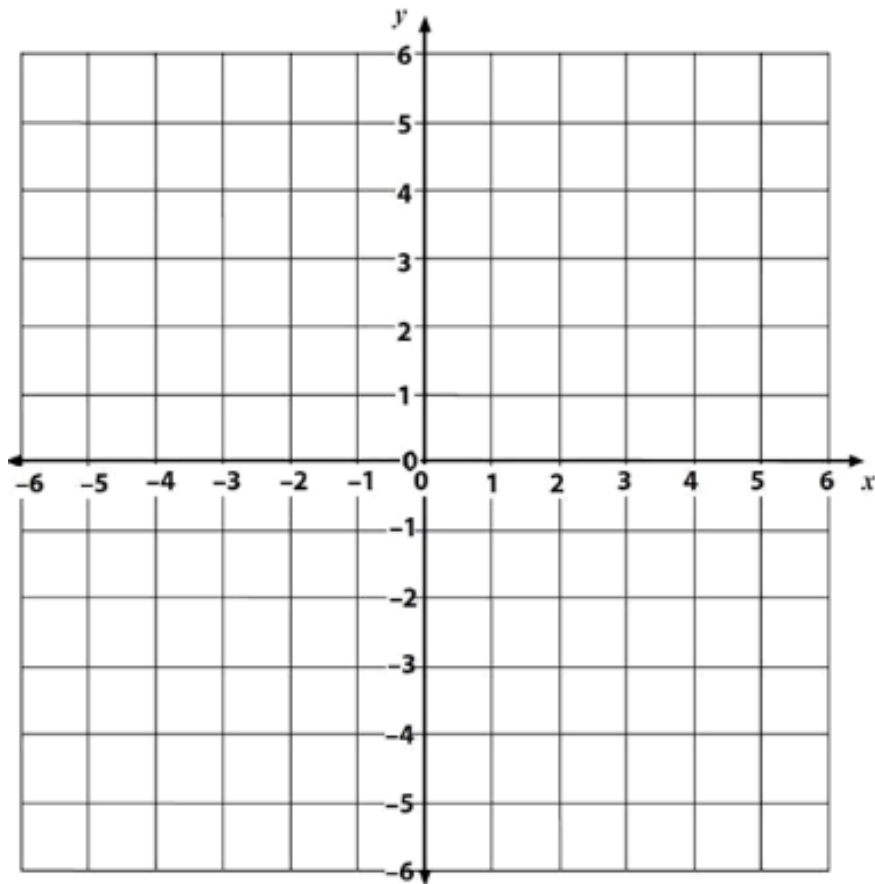
$$x > -3, y \leq 4 \text{ and } y < x - 2$$



Worked example

Shade the region which satisfies the inequalities:

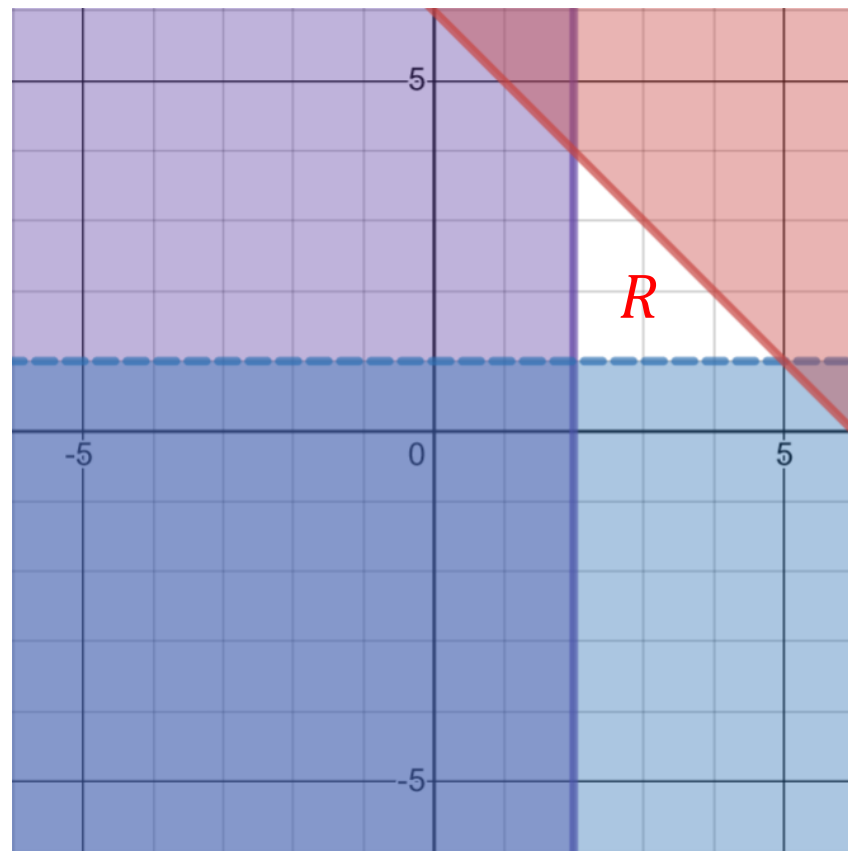
$$x \geq 2, y > -1 \text{ and } x + y \leq 5$$



Your turn

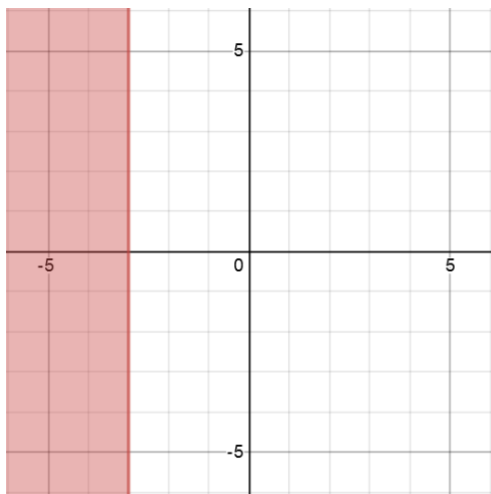
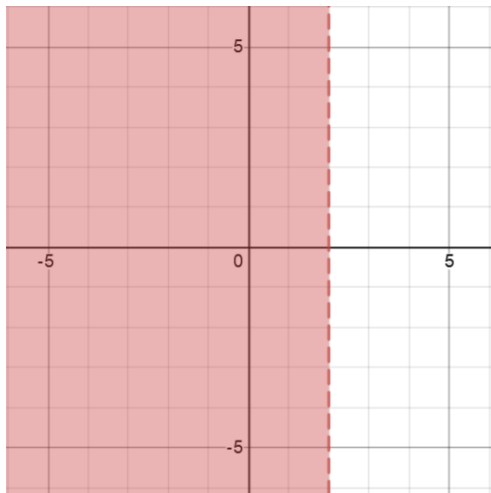
Shade the region which satisfies the inequalities. Label it R.

$$x \geq 2, y > 1 \text{ and } x + y \leq 6$$



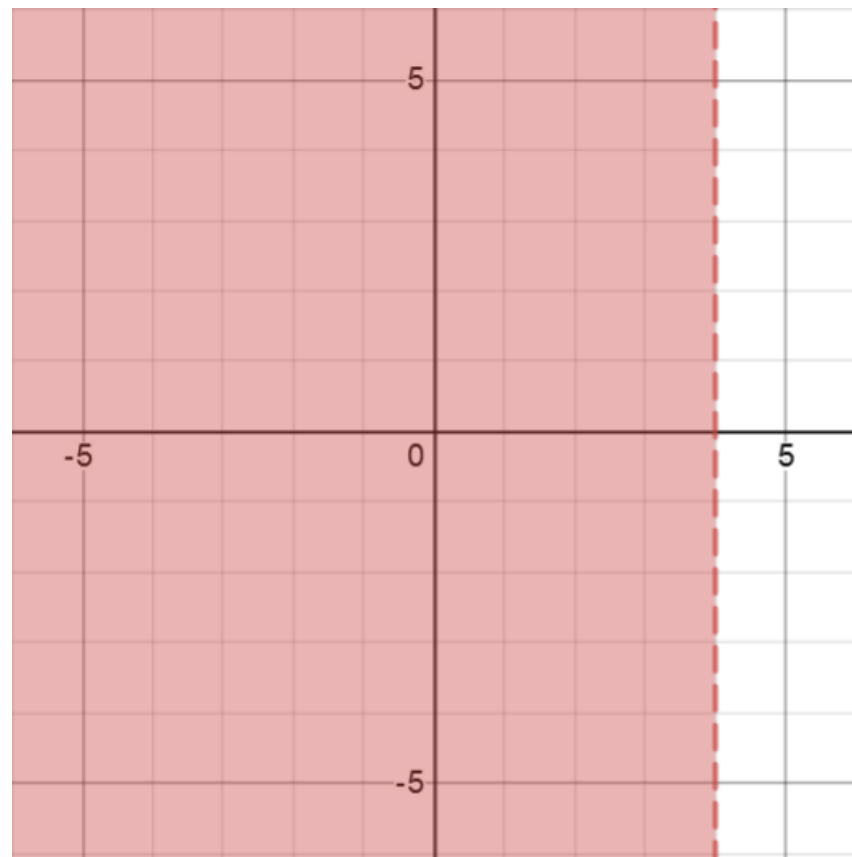
Worked example

Write the inequality that defines the red region:



Your turn

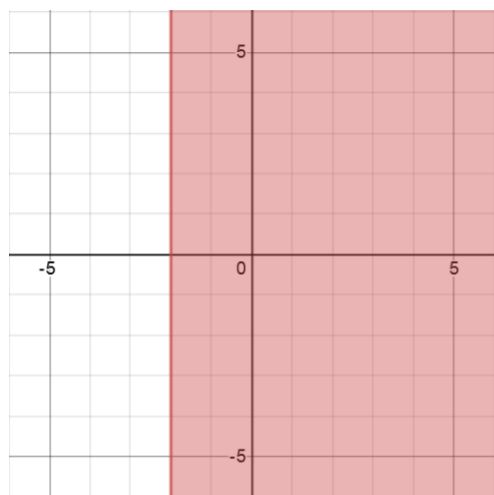
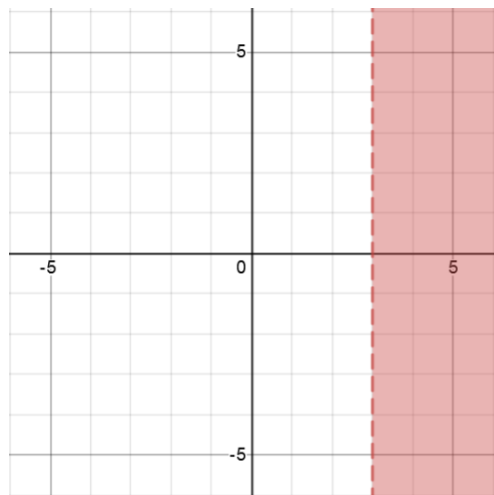
Write the inequality that defines the red region:



$$x < 4$$

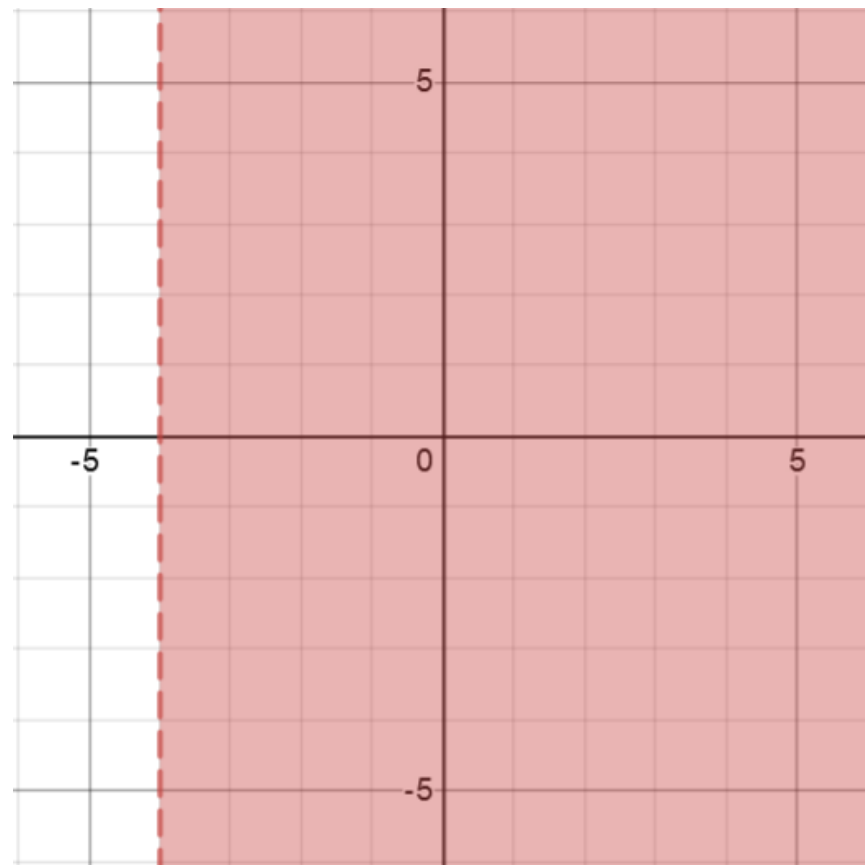
Worked example

Write the inequality that defines the red region:



Your turn

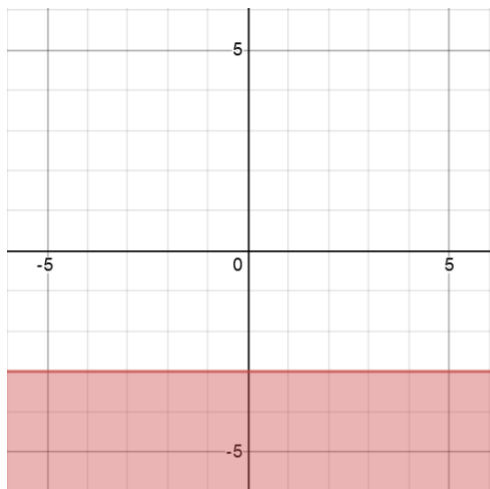
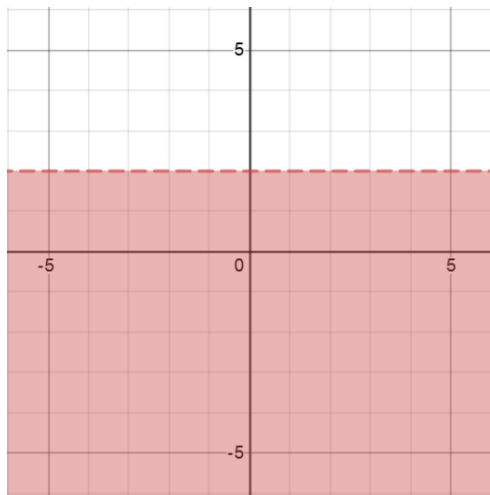
Write the inequality that defines the red region:



$$x > -4$$

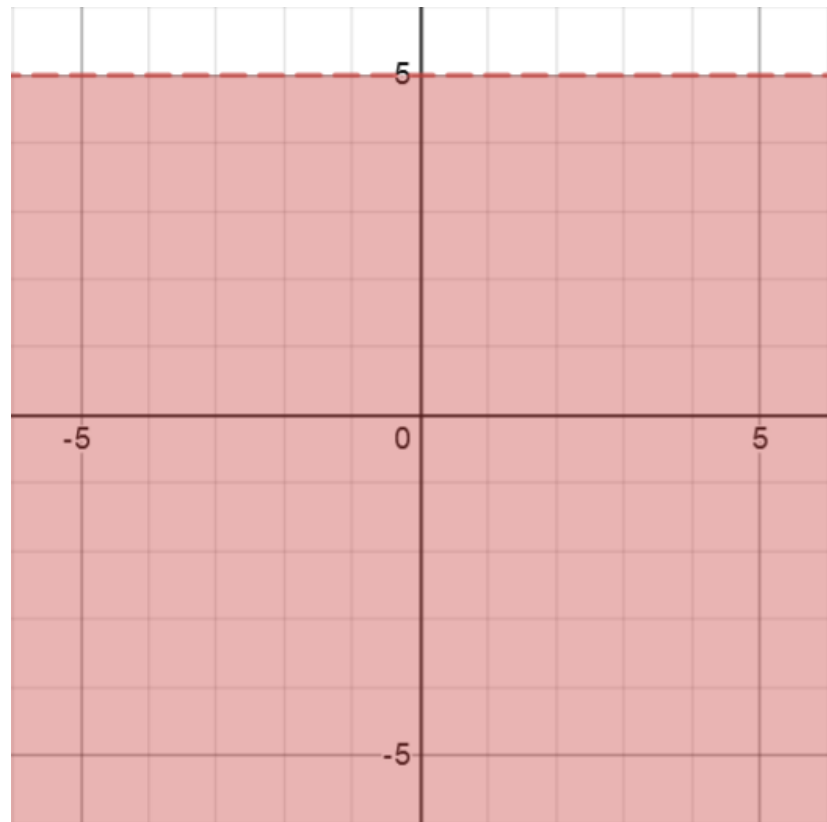
Worked example

Write the inequality that defines the red region:



Your turn

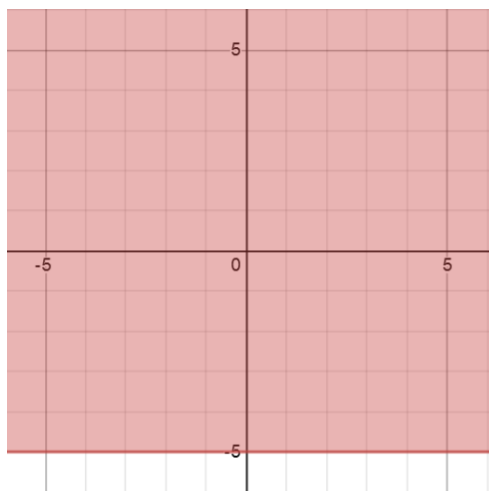
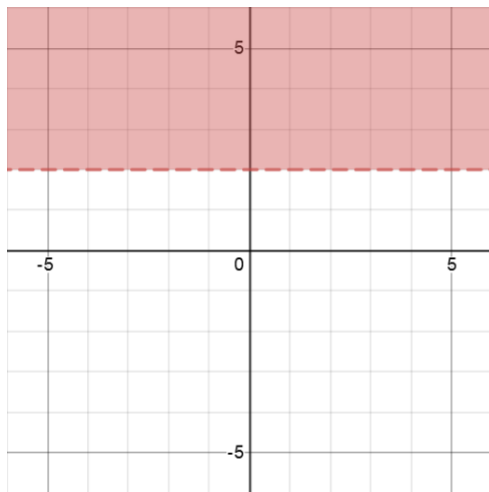
Write the inequality that defines the red region:



$$y < 5$$

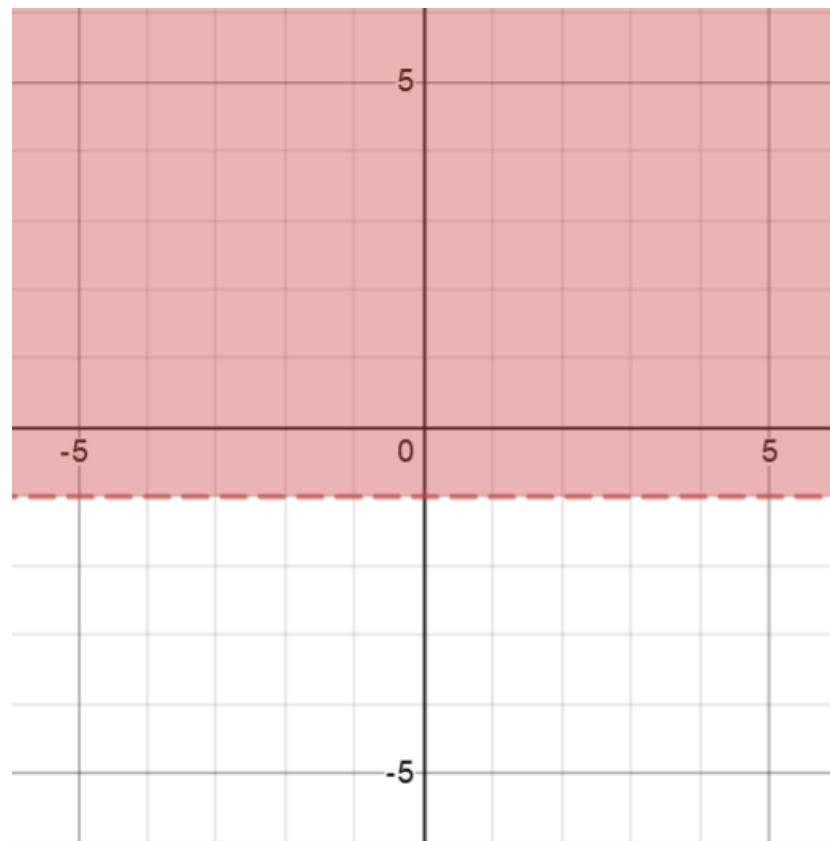
Worked example

Write the inequality that defines the red region:



Your turn

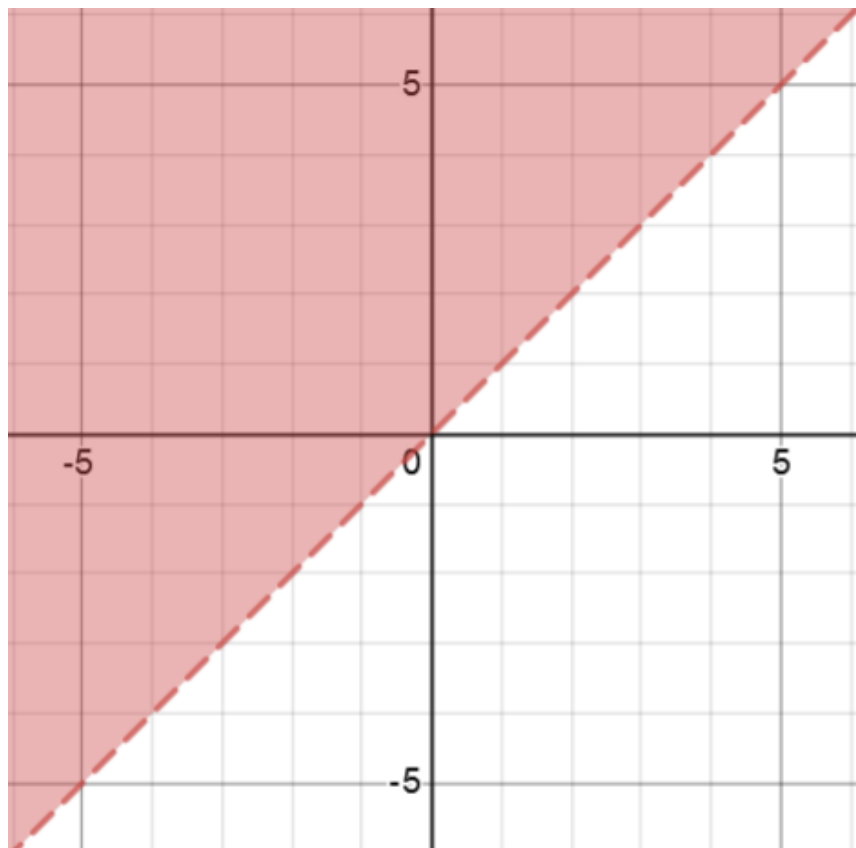
Write the inequality that defines the red region:



$$y > -1$$

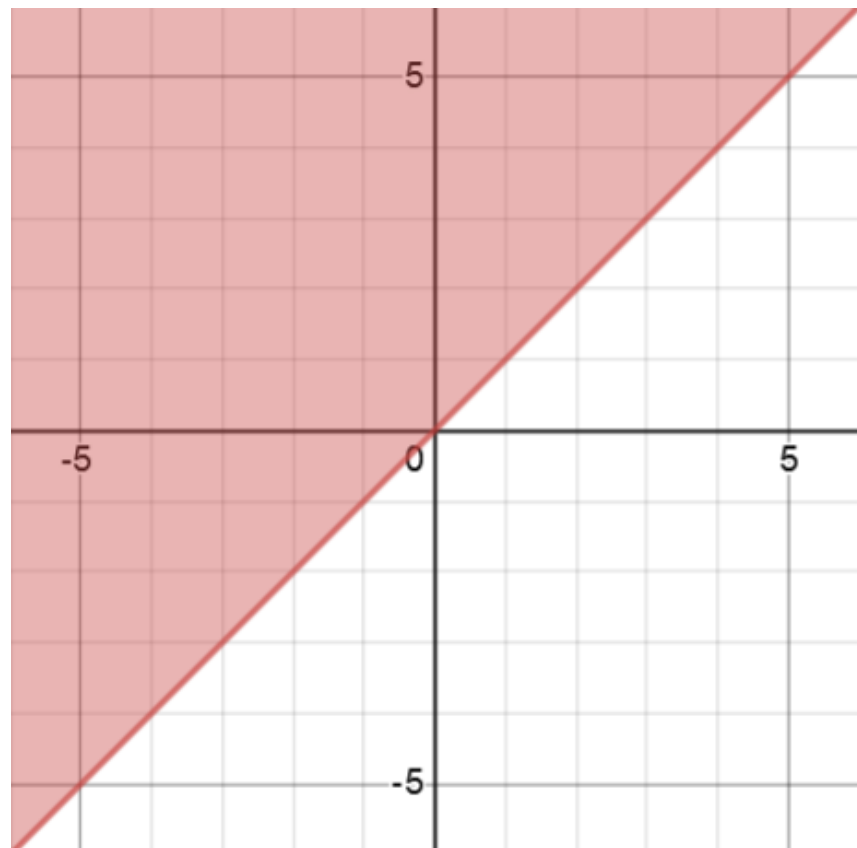
Worked example

Write the inequality that defines the red region:



Your turn

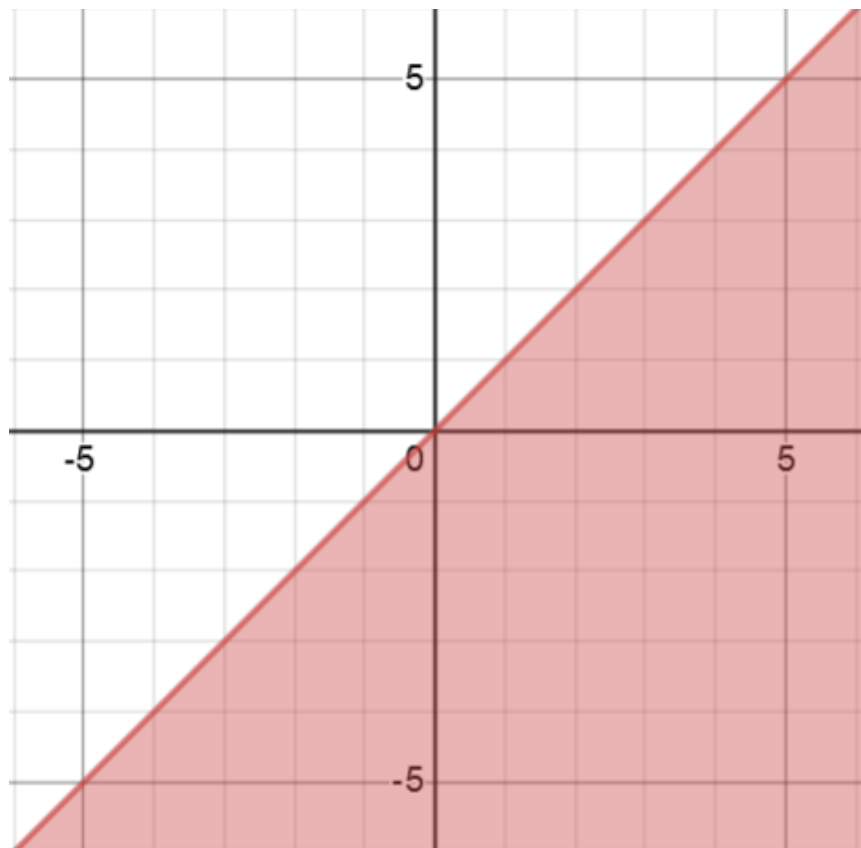
Write the inequality that defines the red region:



$$y \geq x$$

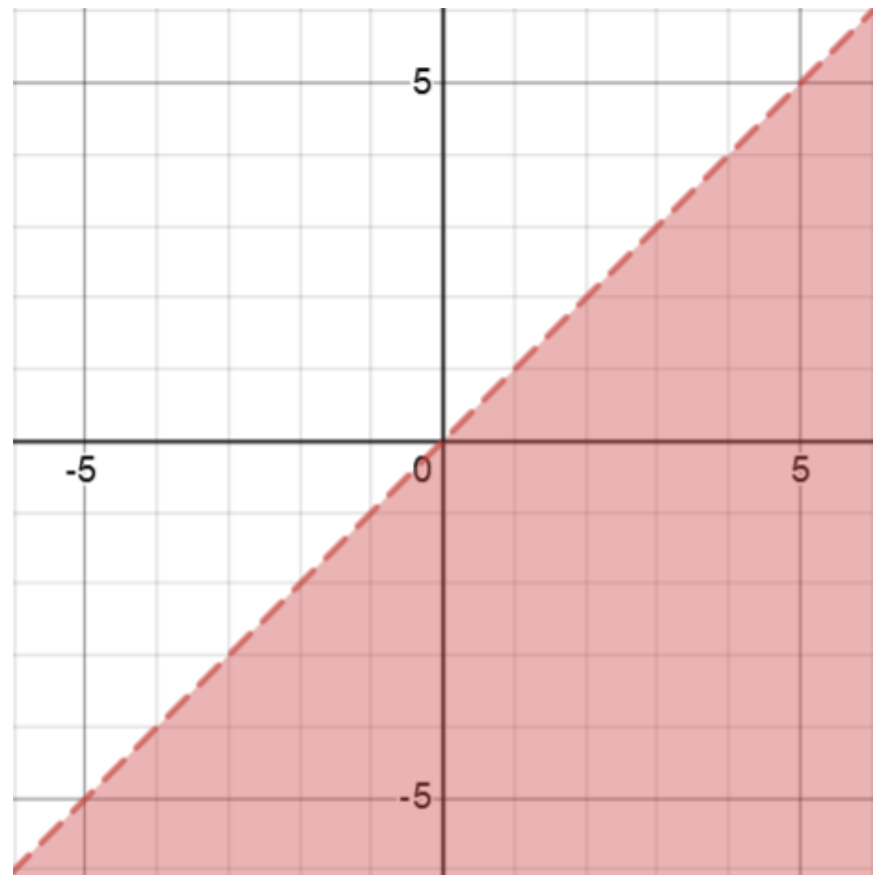
Worked example

Write the inequality that defines the red region:



Your turn

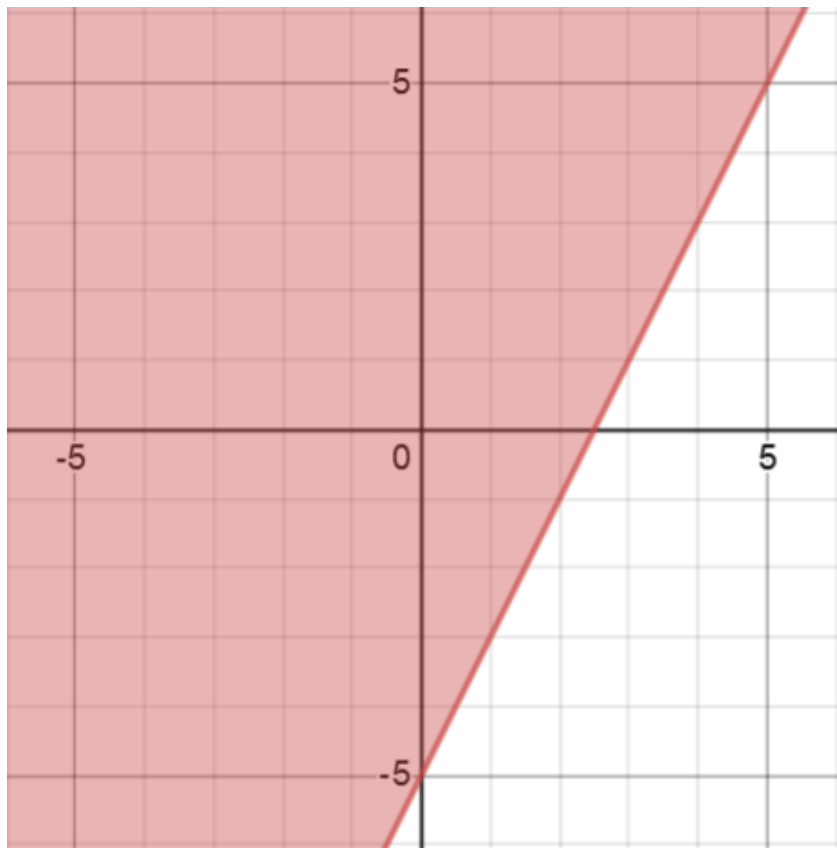
Write the inequality that defines the red region:



$$y < x$$

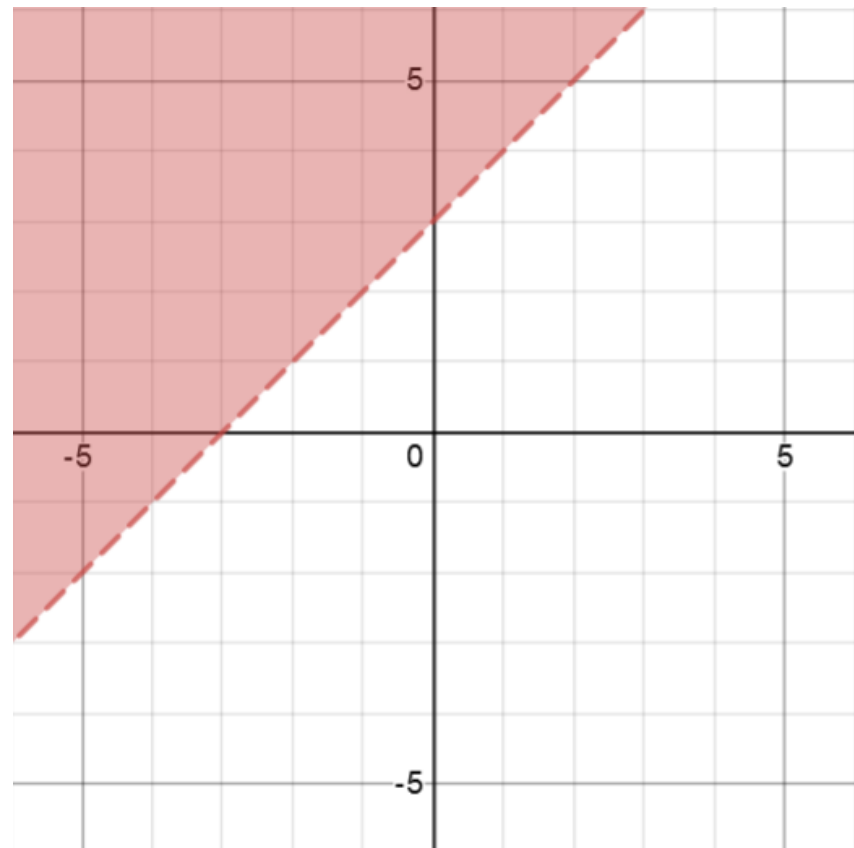
Worked example

Write the inequality that defines the red region:



Your turn

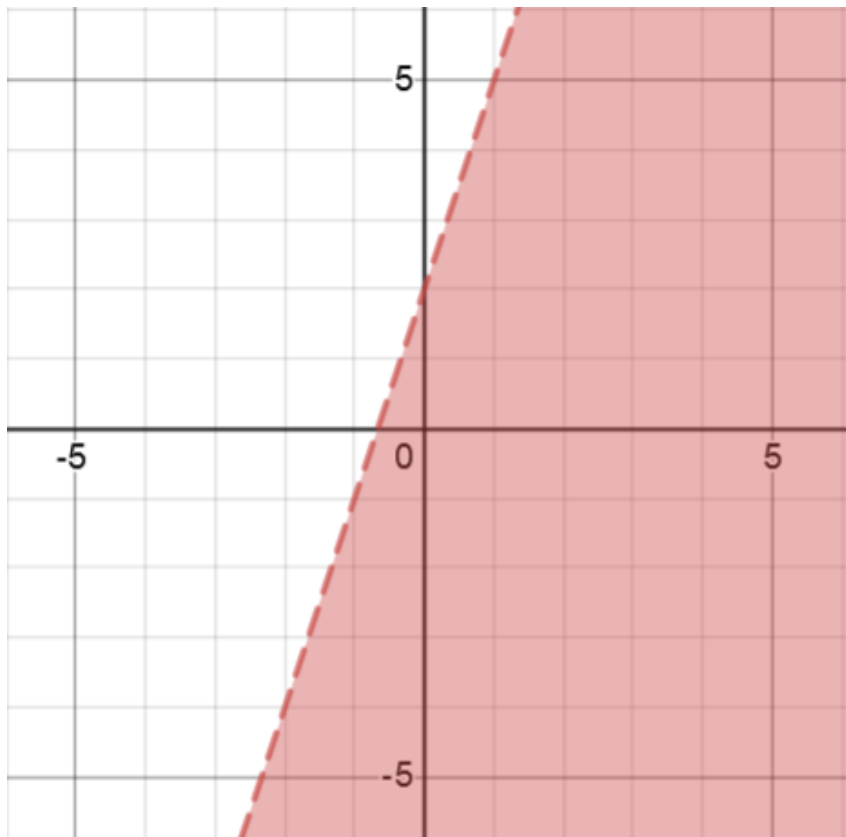
Write the inequality that defines the red region:



$$y > x + 3$$

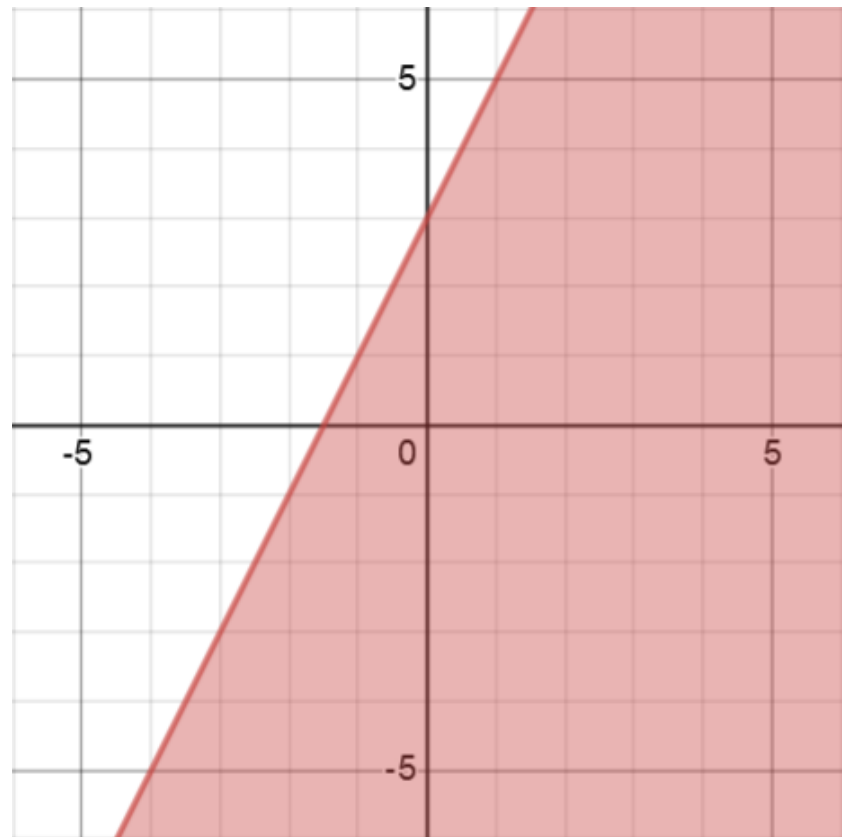
Worked example

Write the inequality that defines the red region:



Your turn

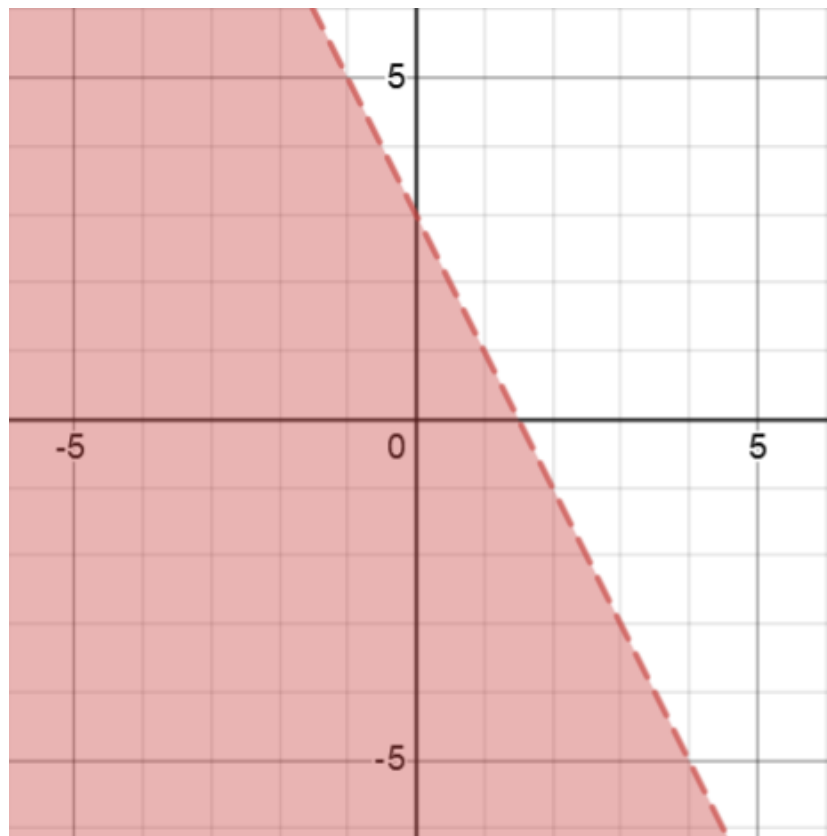
Write the inequality that defines the red region:



$$y \leq 2x + 3$$

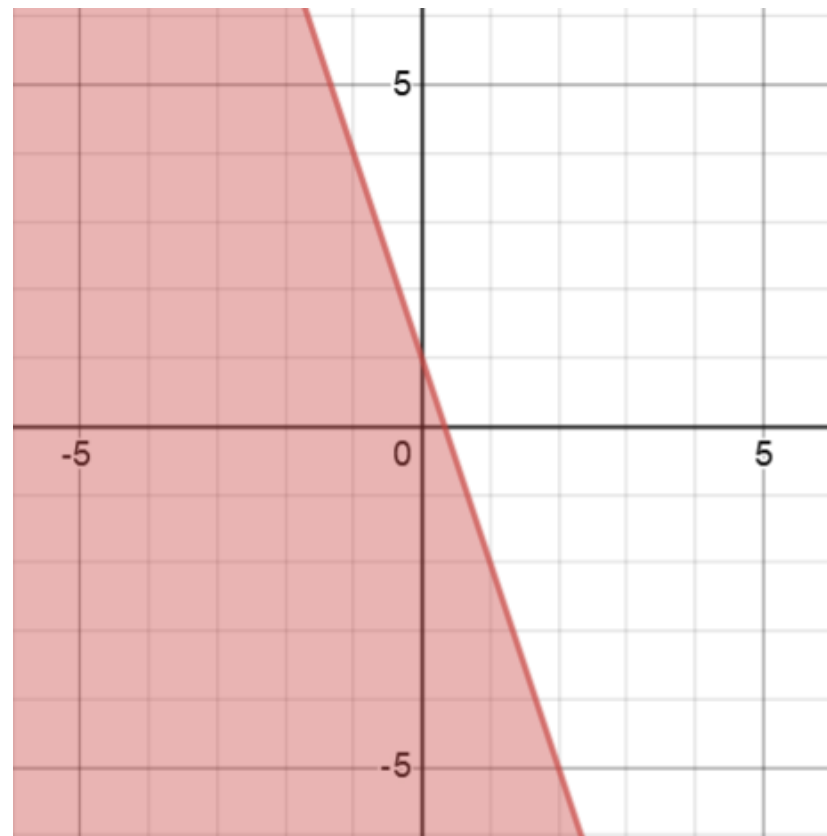
Worked example

Write the inequality that defines the red region:



Your turn

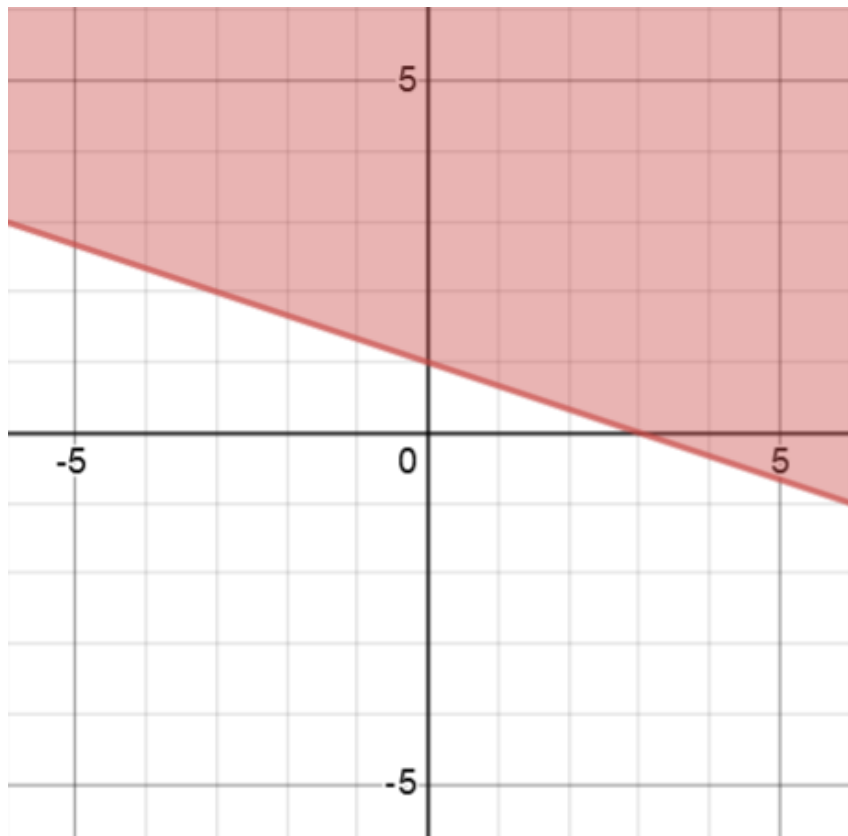
Write the inequality that defines the red region:



$$y \leq 1 - 3x$$

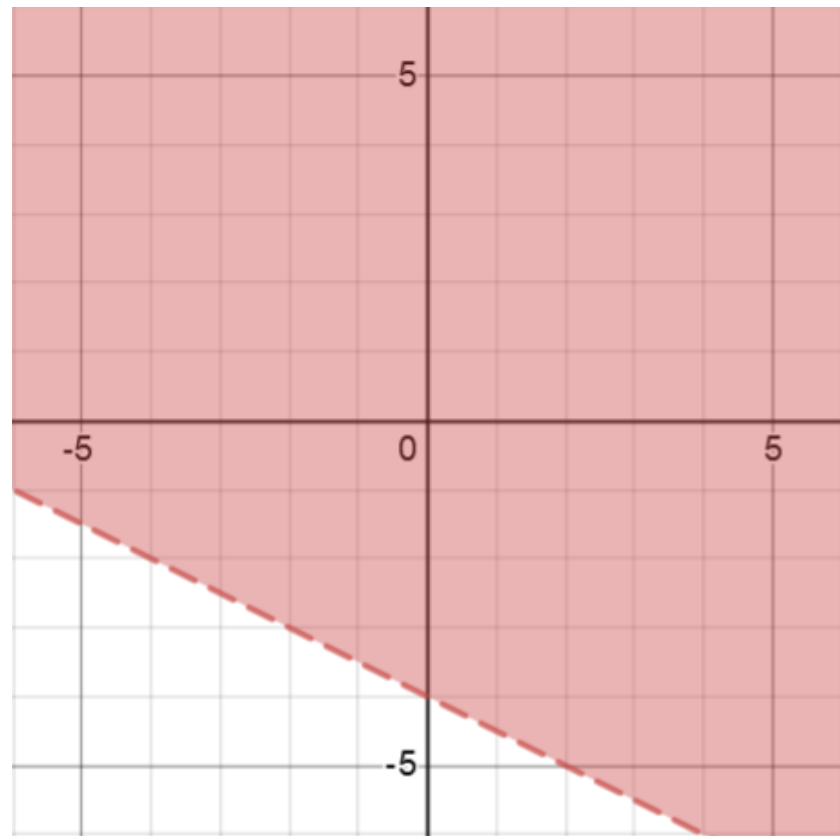
Worked example

Write the inequality that defines the red region:



Your turn

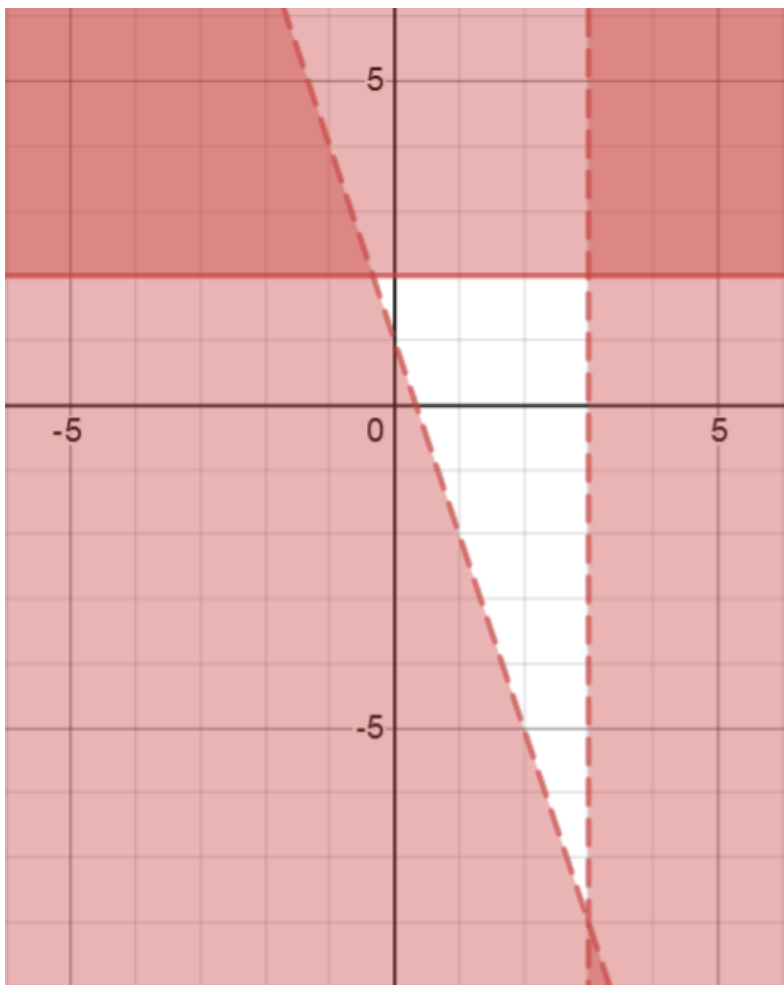
Write the inequality that defines the red region:



$$y > -\frac{1}{2}x - 4$$

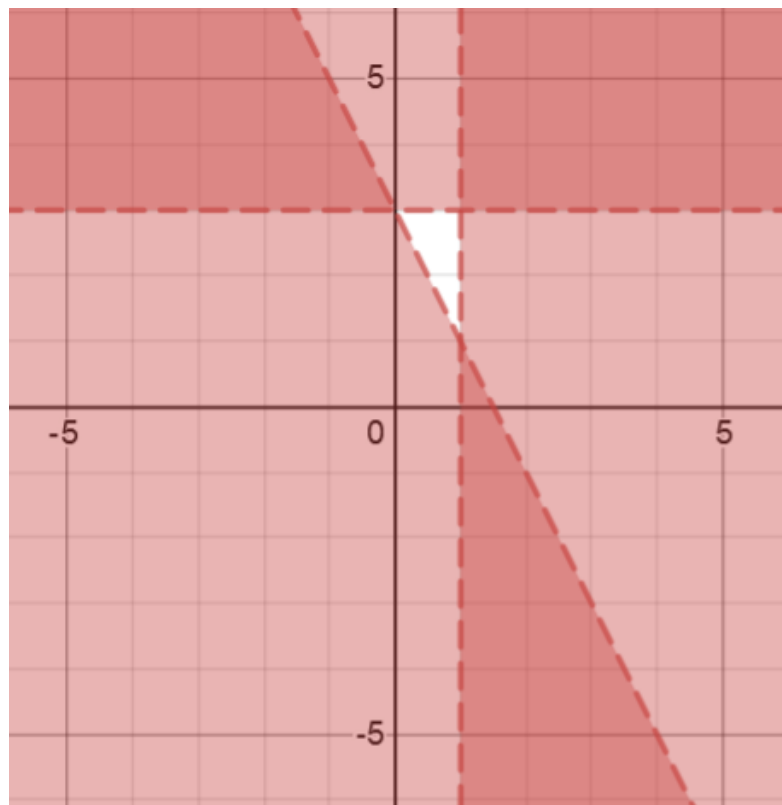
Worked example

Write the inequalities that define the unshaded region:



Your turn

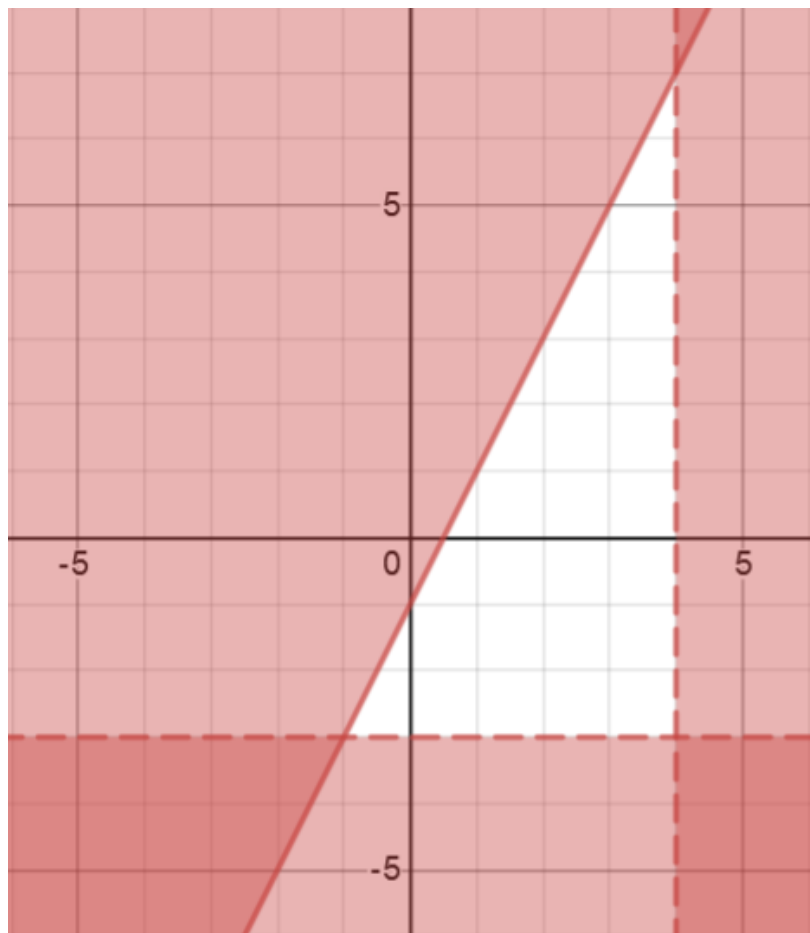
Write the inequalities that define the unshaded region:



$$\begin{aligned}x &< 1 \\y &< 3 \\y &> -2x + 3\end{aligned}$$

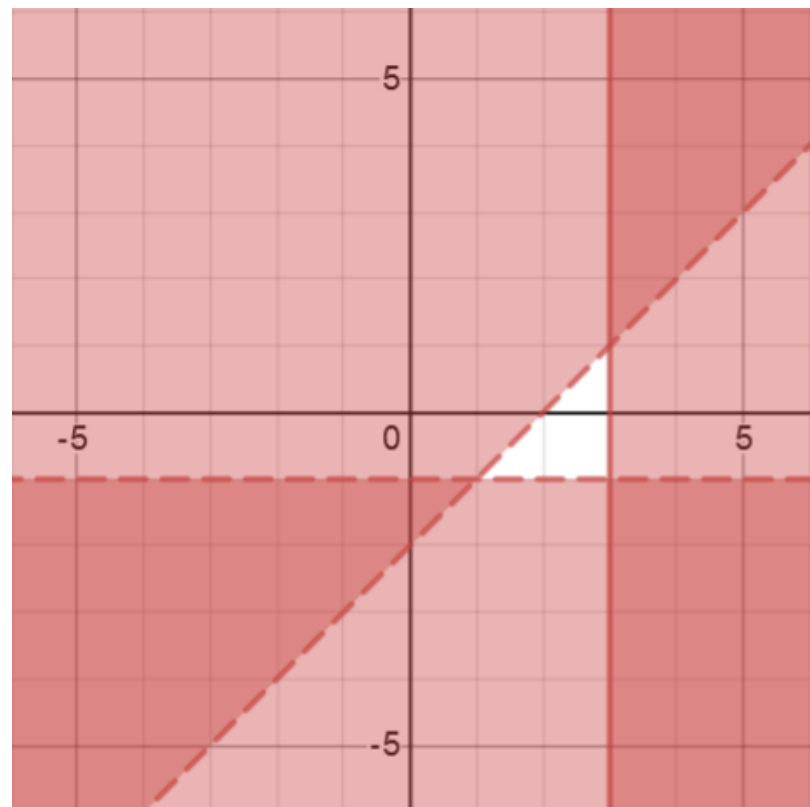
Worked example

Write the inequalities that define the unshaded region:



Your turn

Write the inequalities that define the unshaded region:



$$\begin{aligned}x &\leq 3 \\y &> -1 \\y &< x - 2\end{aligned}$$