

# Linear Inequalities in Two Variables

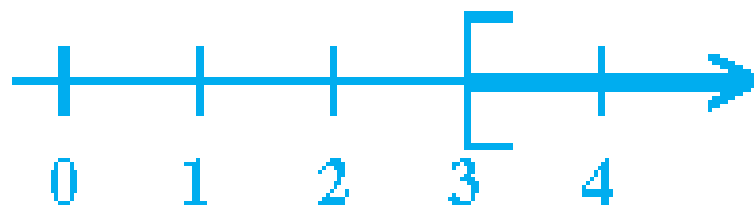
# Graphing Intervals Written in Interval Notation on a Number Line

## EXAMPLE 1

Write each inequality in interval notation and graph the interval.

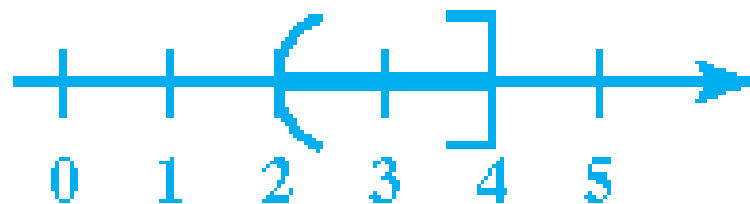
$$x \geq 3$$

Solution  $[3, \infty)$



$$2 < x \leq 4$$

Solution  $(2, 4]$



# Solving a Linear Inequality

## EXAMPLE 5

Solve the inequality; then graph the solution set.

$$4(x - 1) - 3x > -15 - (2x + 1)$$

Solution:

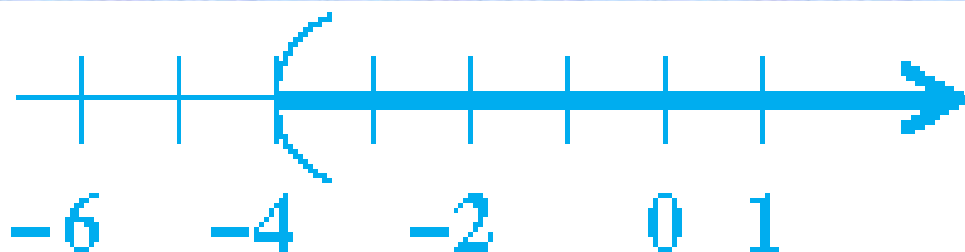
$$4x - 4 - 3x > -16 - 2x + 2x$$

$$3x - 4 + 4 > -16 + 4$$

$$\frac{3x}{3} > \frac{-12}{3}$$

$$x > -4$$

$(-4, \infty)$



## EXAMPLE 6 Finding an Average Test Score

Maggie has scores of 98, 86, and 88 on her first three tests in algebra. If she wants an average of at least 90 after her fourth test, what score must she make on that test?

*Solution:* Let  $x$  = Maggie's fourth test score.

$$\frac{98 + 86 + 88 + x}{4} \geq 90 \qquad x \geq 88$$

$$(4) \frac{272 + x}{4} \geq 90(4)$$

$$272 + x - 272 \geq 360 - 272$$

Maggie must get greater than or equal to an 88.

# EXAMPLE 7

## Solving Three-Part Inequalities

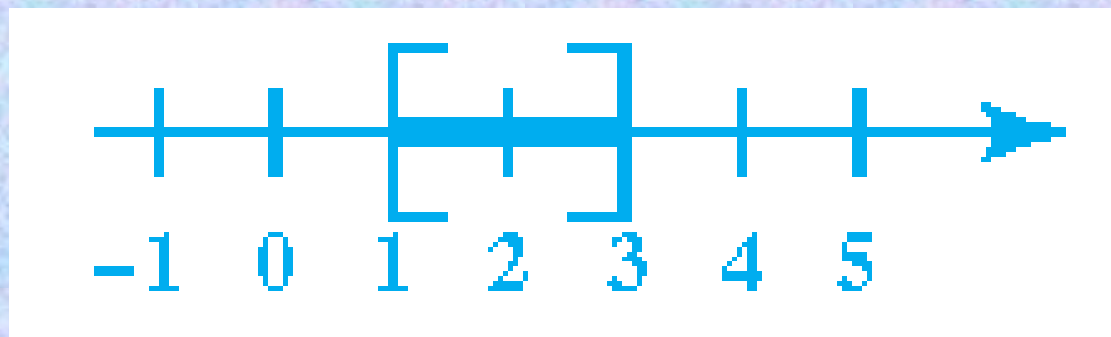
Solve  $2 \leq 3x - 1 \leq 8$  and graph the solution set.

Solution:  $2 + 1 \leq 3x - 1 + 1 \leq 8 + 1$

$$\frac{3}{3} \leq \frac{3x}{3} \leq \frac{9}{3}$$

$$1 \leq x \leq 3$$

$[1, 3]$



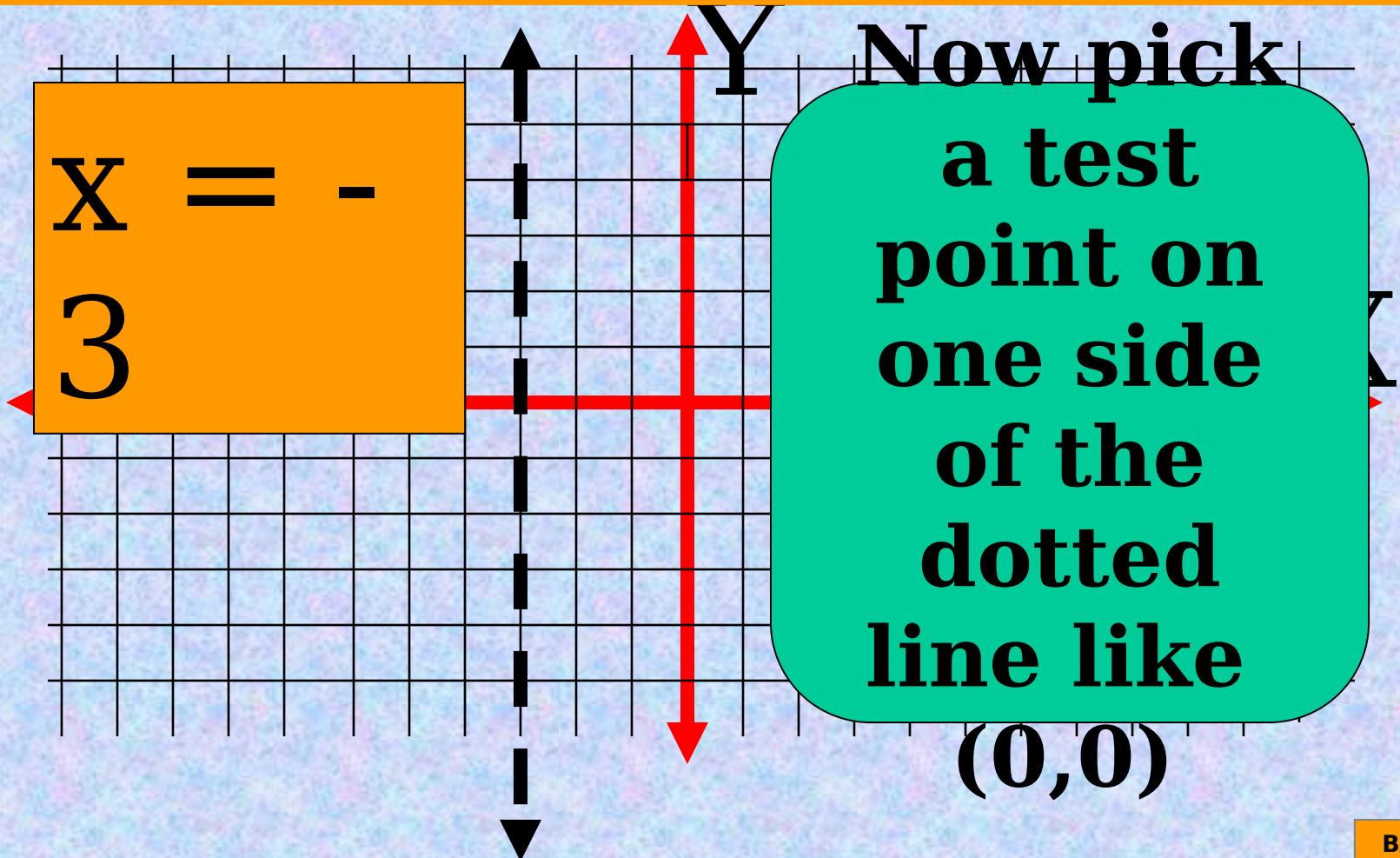
Remember to work with all three parts of the inequality.

# Graphing Inequalities

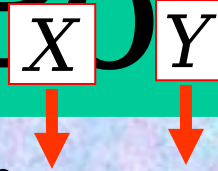
- The solution set for an inequality contain many ordered pairs. The graphs of these ordered pairs fill in an area of the coordinate plane and may or may not include points on the boundary line.

# Graph $x < -3$

## Sketch $x = -3$



# Test a Point



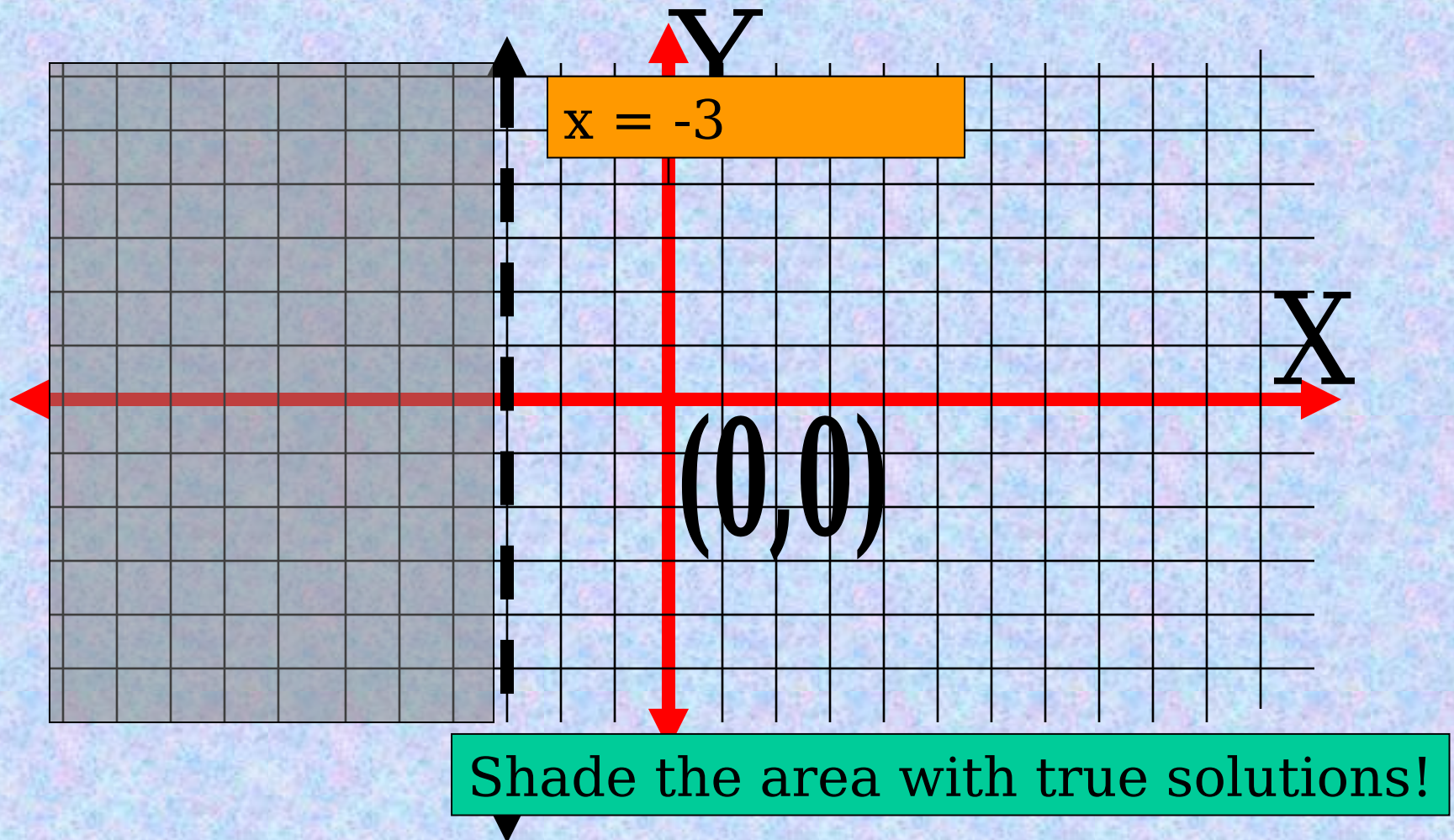
- Take the point (0,0) and plug in the x value in  $x < -3$

- $x < -3$

False

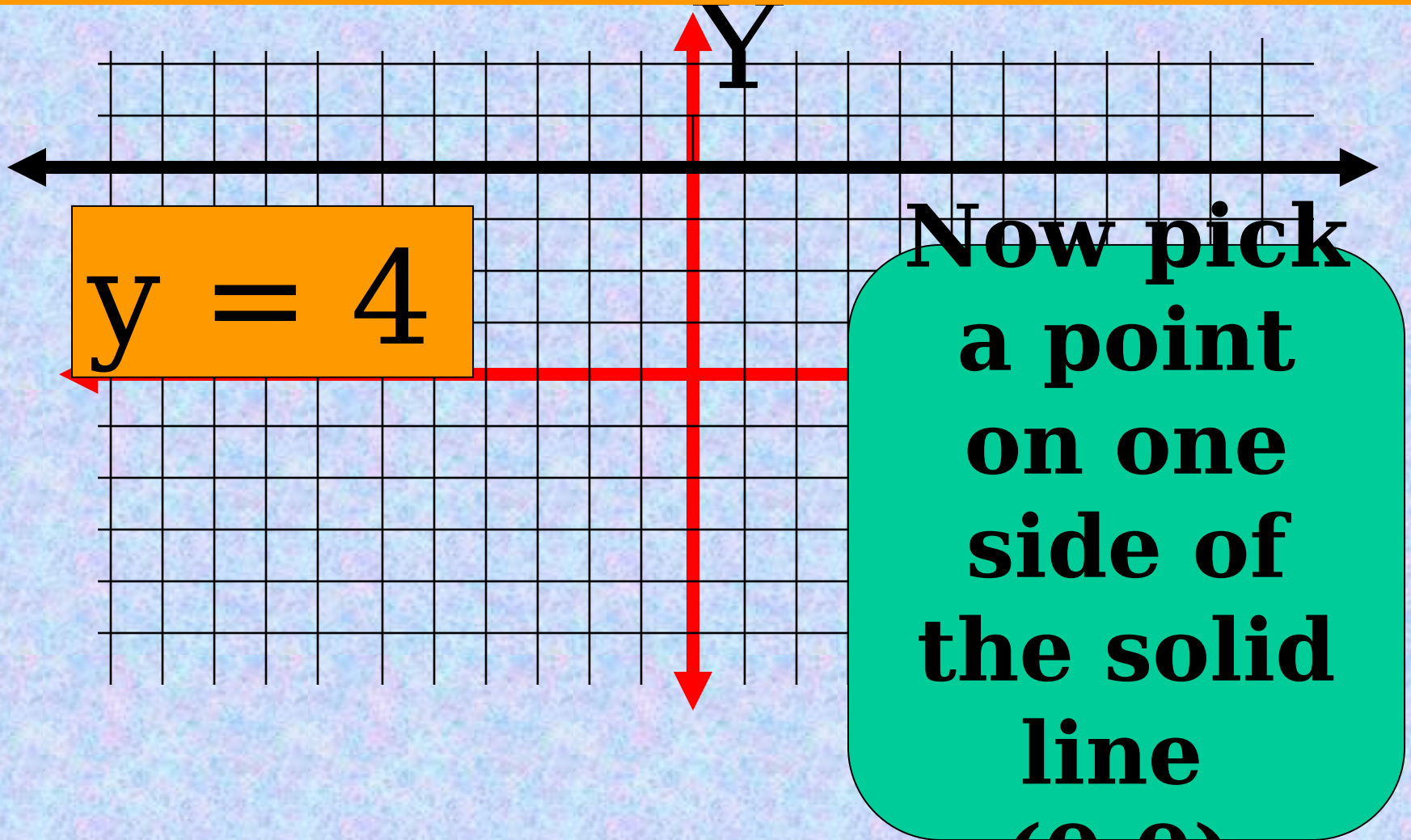
- Since it's false, shade the side opposite of (0,0)

Graph  $x < -3$



# Graph $y \leq 4$

## Sketch $y = 4$



# Test a Point

- Take the point (0,0) and plug in the y value in  $y \leq 4$

- $y \leq 4$

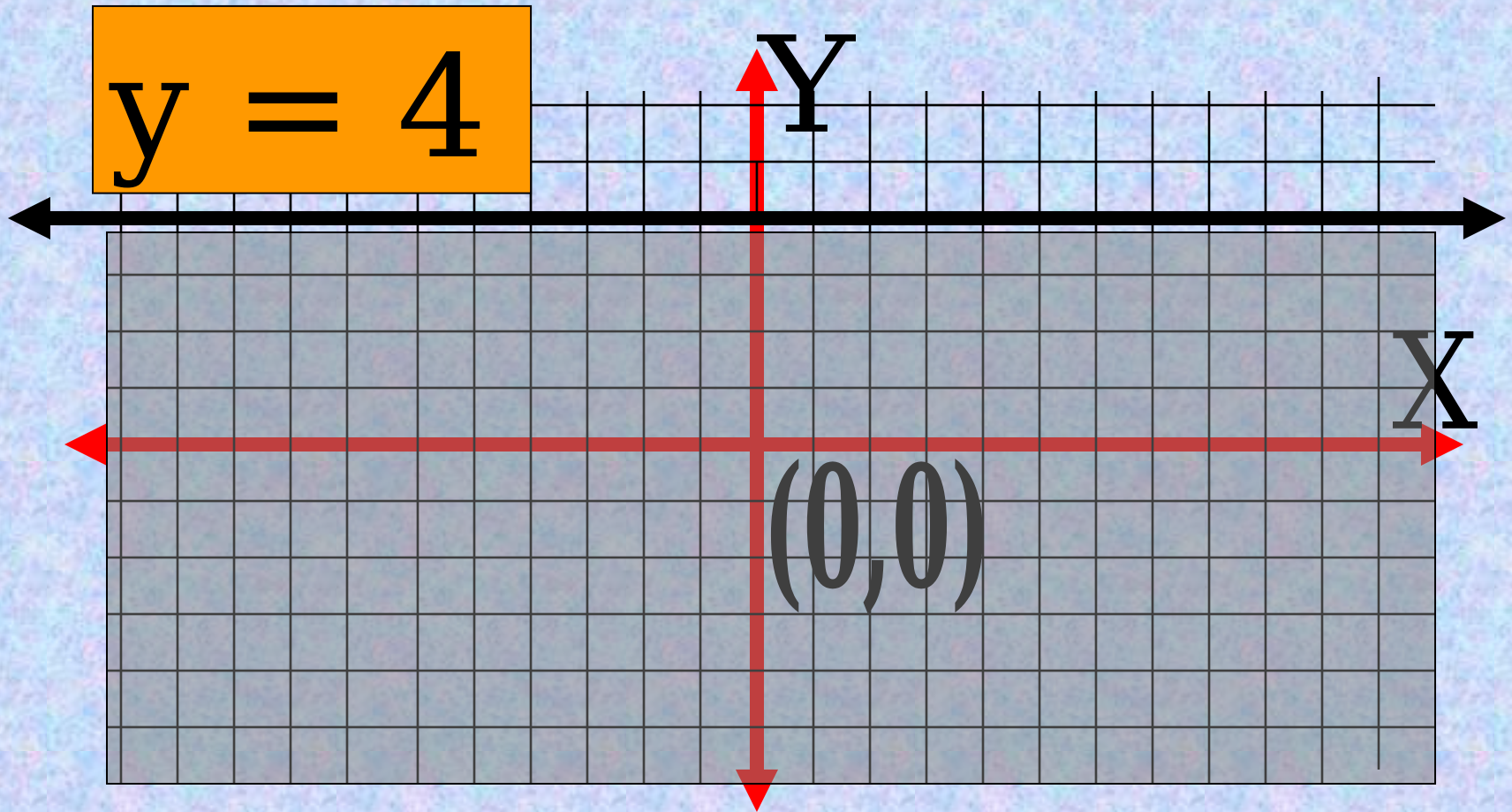
- $0 \leq 4$

True

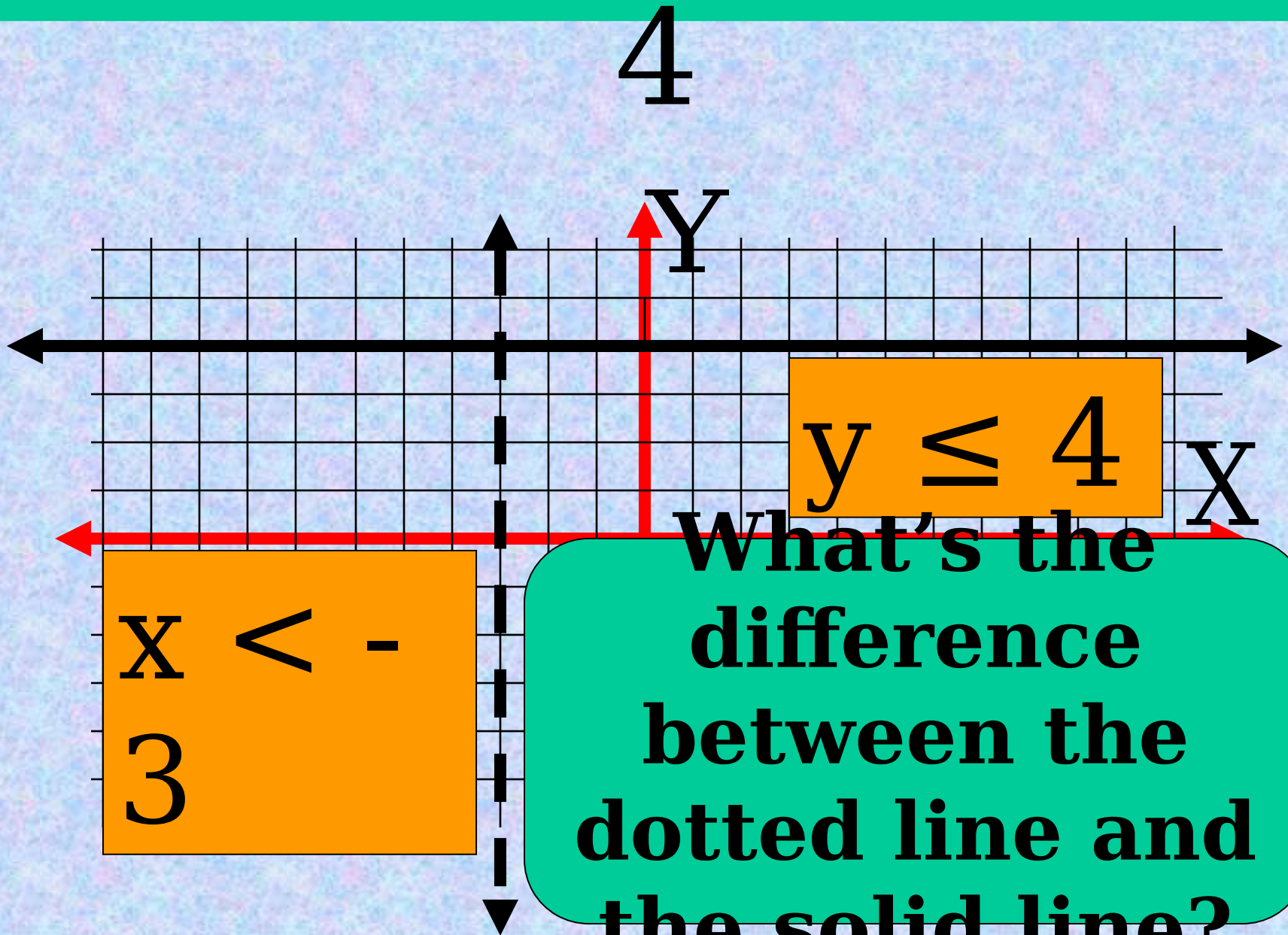
Since it's True,  
shade the side that

# Graph $x < -3$ & $y \geq$

4



# Graph $x < -3$ & $y \leq 4$



# Dotted or Solid Lines???

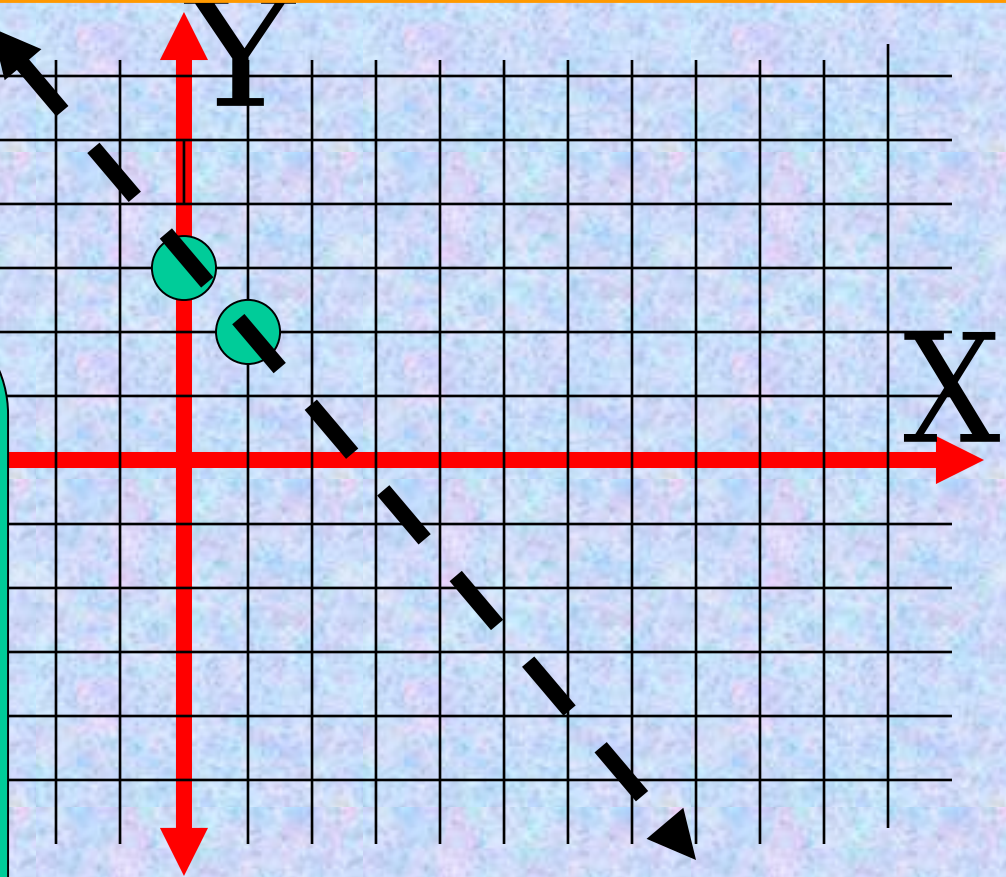
- Use a solid line if your equation contains any part of an equal sign (  $=$ ,  $\leq$ ,  $\geq$  ) to show that points that fall on the line are include in the solution.
- Use a dotted or dashed line if you have  $<$  or  $>$  to show that the points on this line are not part of the solution area.

# Graph $x + y < 3$

## Sketch $y = -x + 3$

**Now pick**

**a point  
on one  
side of  
the  
dotted  
line**



# Test a Point

- Take the point  $(0,0)$  and plug in the values in  $y < -x + 3$

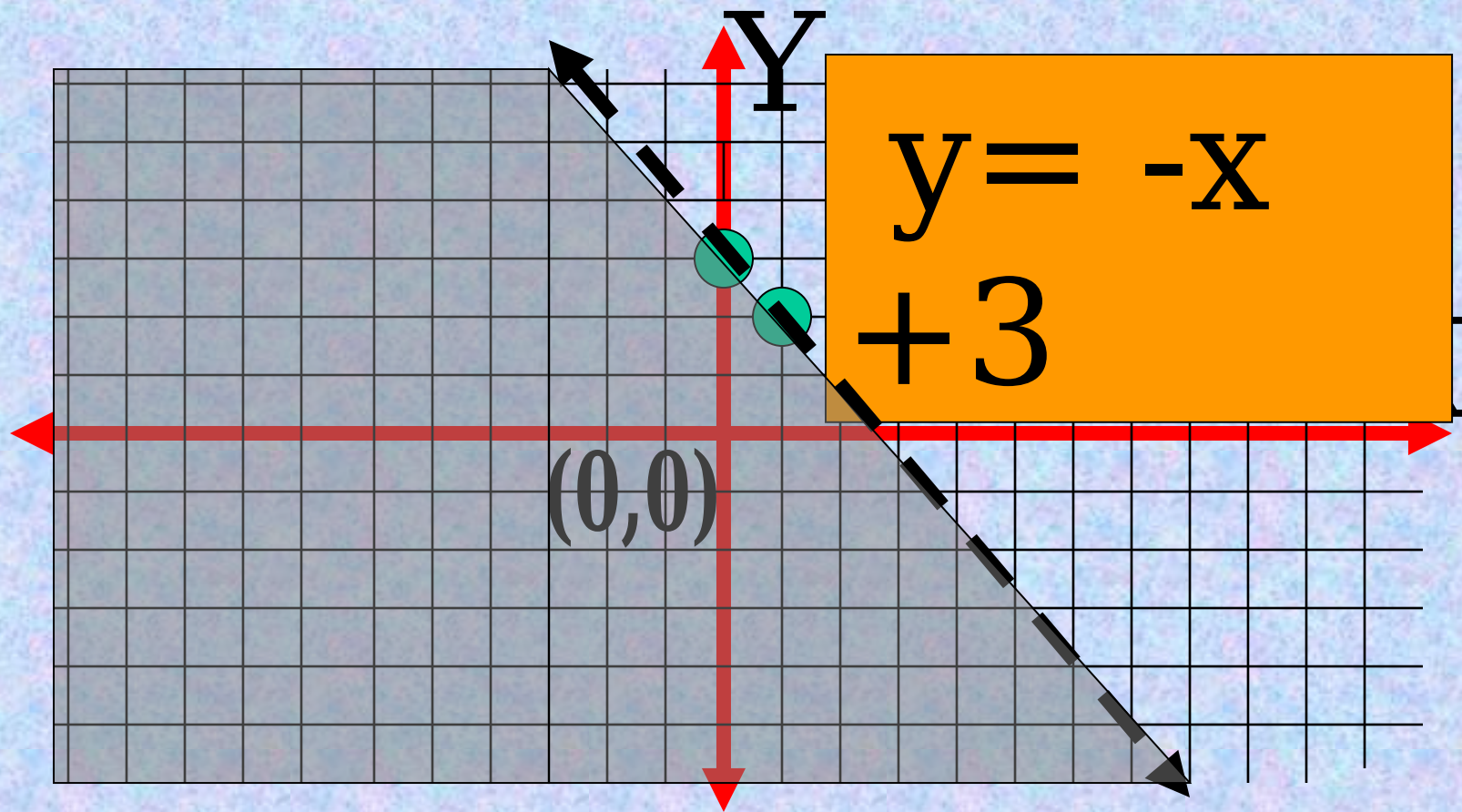
- $y < -x + 3$

- $0 < -0 + 3$

- (Since it's True, shade the side that  $(0,0)$  is on

True

# Graph $x + y < 3$



# You try this one

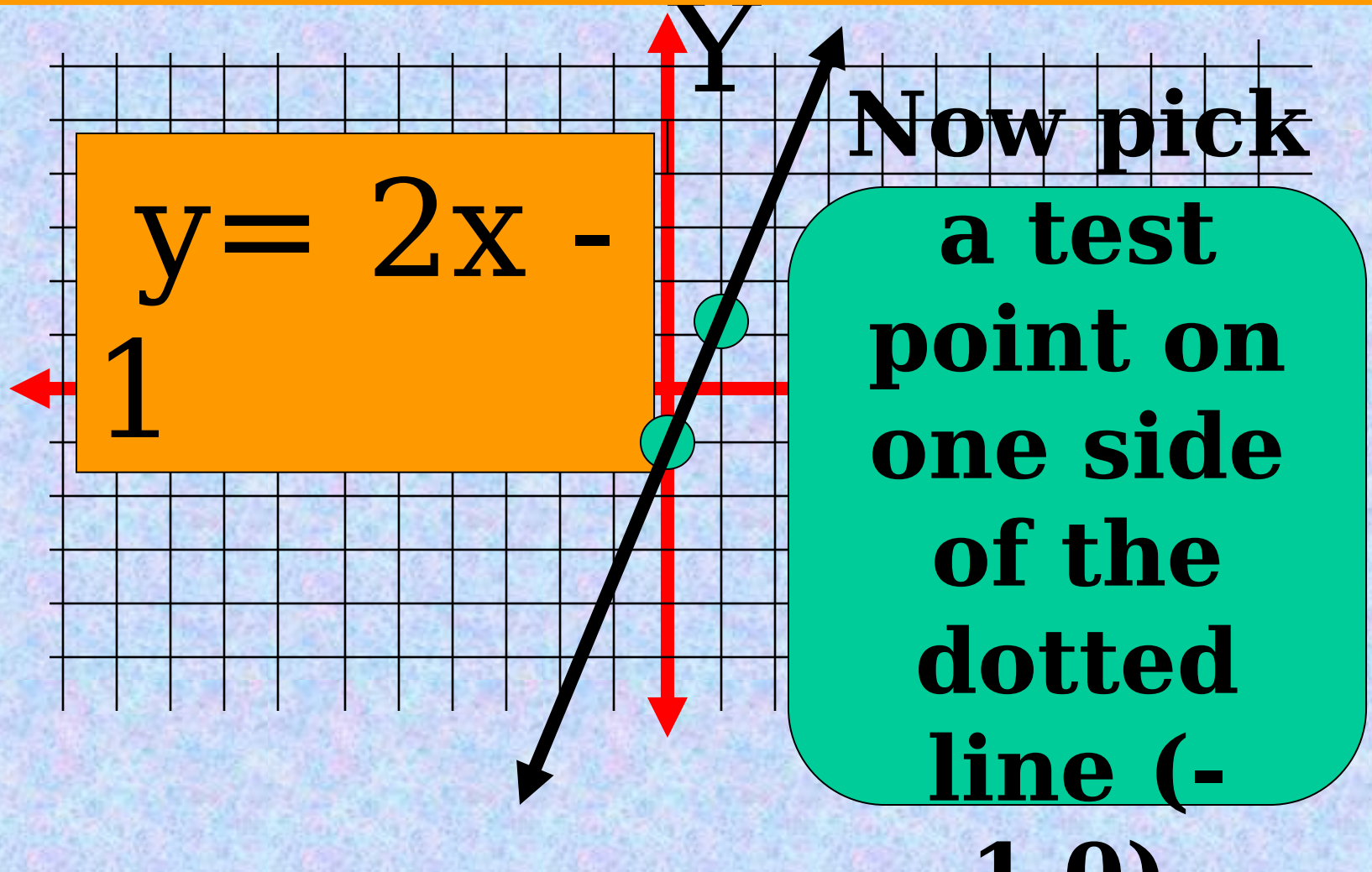
- Graph  $y \leq 2x -$

1

You  
try  
this  
one

Graph  $y \leq 2x - 1$

Sketch  $y = 2x - 1$



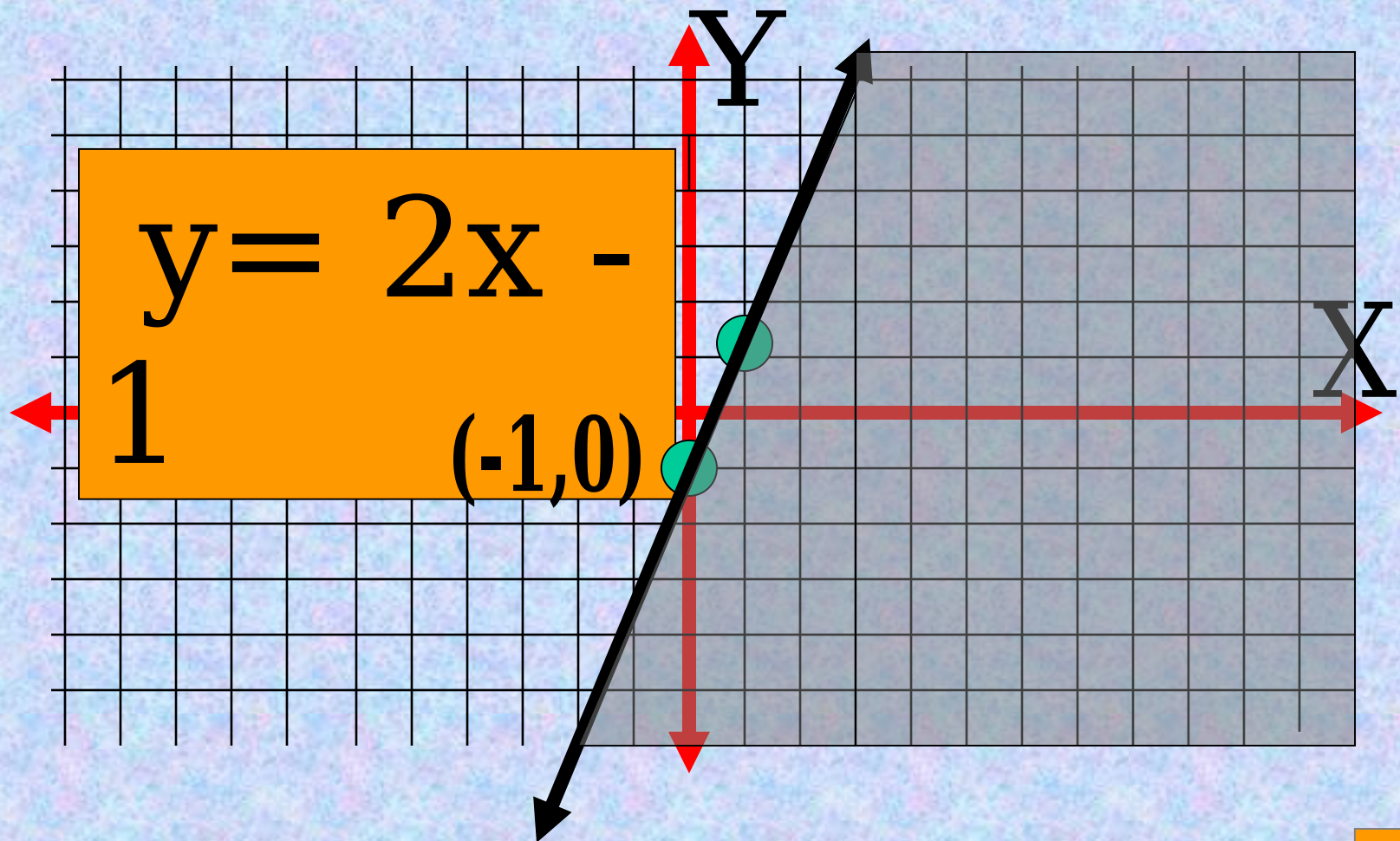
# Test a Point

- Take the point  $(-1, 0)$  and plug in the values in  $y \leq 2x - 1$
- $y \leq 2x - 1$
- $0 \leq 2(-1) - 1$
- $0 \leq -2 - 1$

False

Since it's False,  
shade the opposite

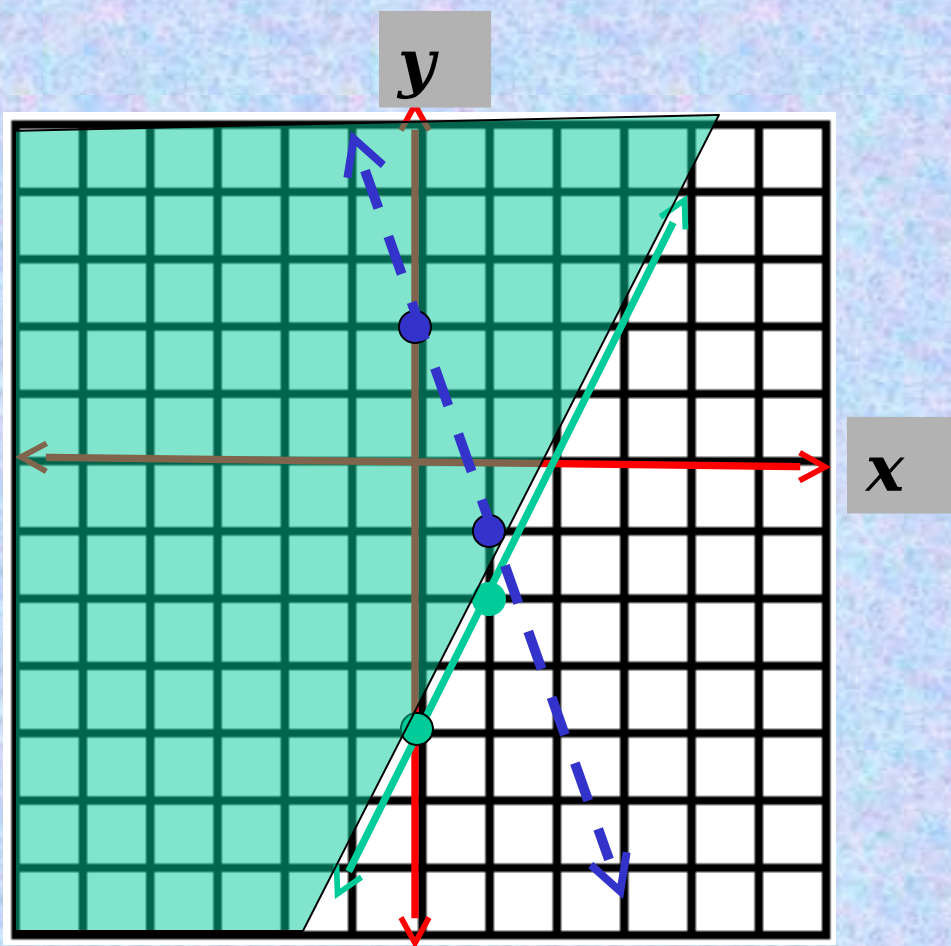
# Graph $y \geq 2x - 1$



**Graph the following linear system of inequalities.**

$$y < -3x + 2$$

$$y \geq 2x - 4$$



Use the slope and y-intercept to plot the two lines.

Draw in the line.

For  $<$  use a dashed line.

Pick a **point** and test it in the inequality. Shade the appropriate region.

**Graph the following linear system of inequalities.**

$$y < -3x + 2$$

$$y \geq 2x - 4$$

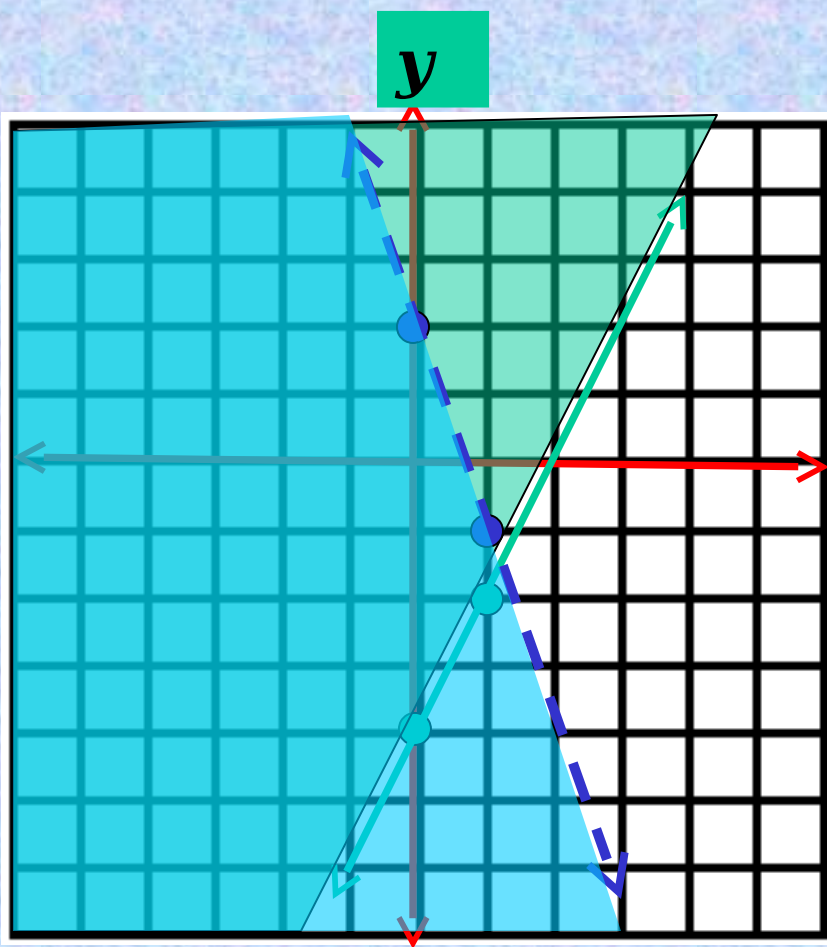
$$y < -3x + 2$$

Point  $(-2, -2)$

$$-2 \geq -3(-2) + 2$$

$$-2 < 8$$

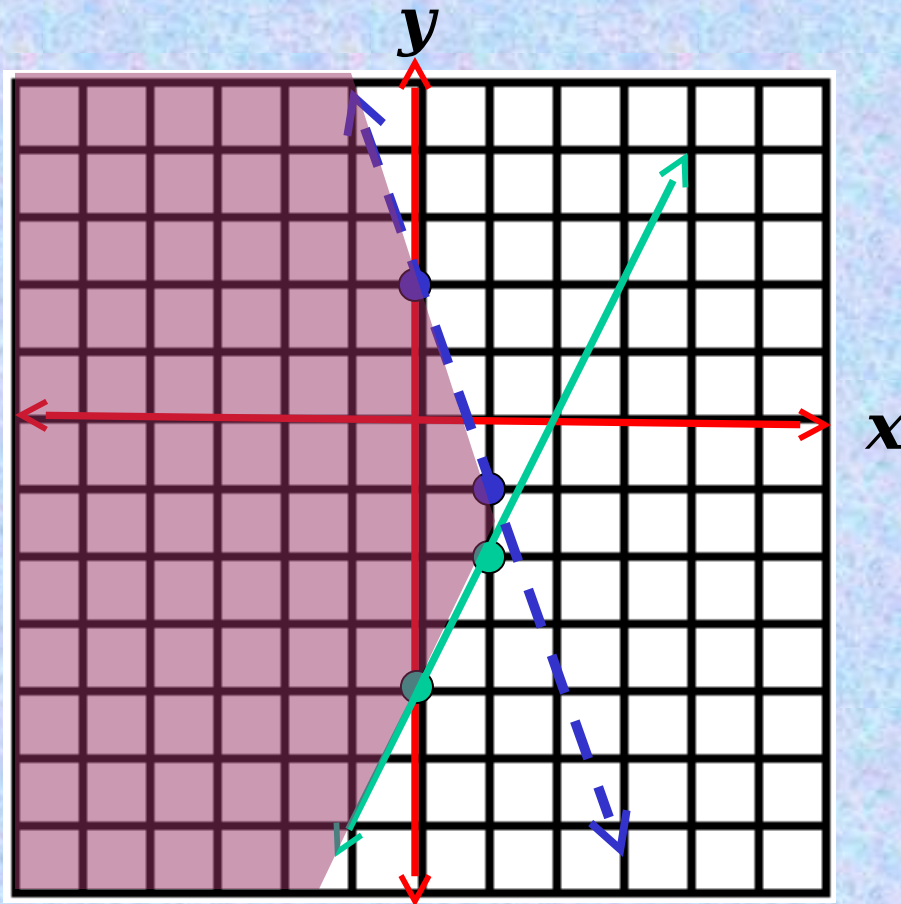
The region  
below the line  
should be  
shaded.



**Graph the following linear system of inequalities.**

$$y < -3x + 2$$

$$y \geq 2x - 4$$



The solution to this system of inequalities is the region where the solutions to each inequality overlap. This is the region above or to the left of the green line and below or to the left of the blue line.

Shade in that