Writing Equations of Lines

I. How to Write an Equation of a Line Given m and b

1. <u>Write</u> down y = *m*x + *b*

2. <u>Substitute</u> *slope* for *m* and *y-intercept* for *b*.

3. <u>Simplify</u> the equation

Write the equation of the line given m and b.

Ex. 1 Slope is -5 and y-intercept is 2

Ex. 2 Slope is -1/2 and y-intercept is -2

Write the equation of the line given m and b.

Ex. 1 Slope is -5 and y-intercept is 2

$$y = -5x + 2$$

Ex. 2 Slope is -1/2 and y-intercept is -2

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

Write the equation of the line given m and b.

Ex. 3 Slope is 0 and y-intercept is 3

Ex. 4 Slope is 1/3 and y-intercept is 0

Write the equation of the line given m and b.
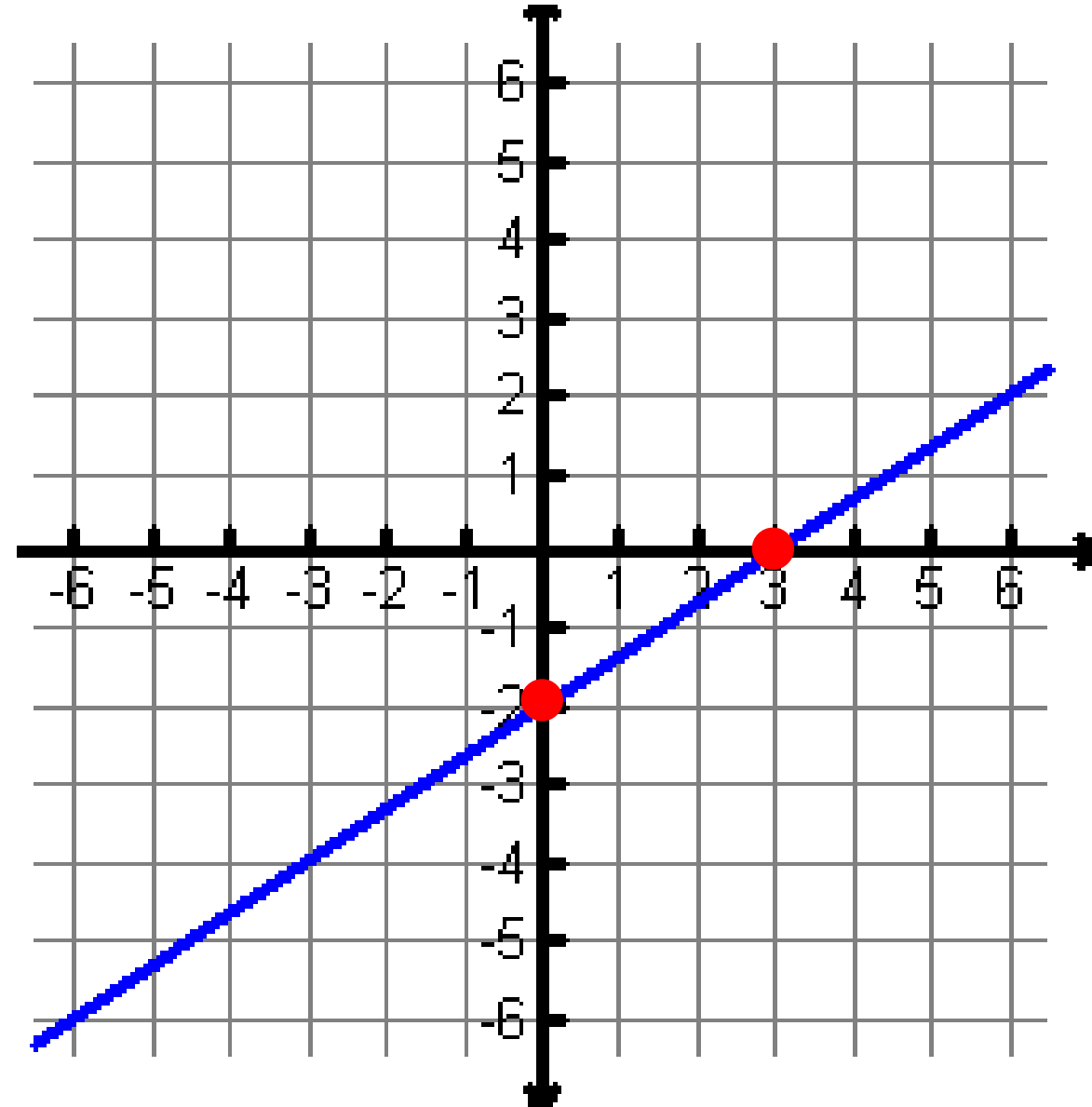
Ex. 3 Slope is 0 and y-intercept is 3

$$y = 3$$

Ex. 4 Slope is 1/3 and y-intercept is 0

$$y = \frac{1}{3}x$$
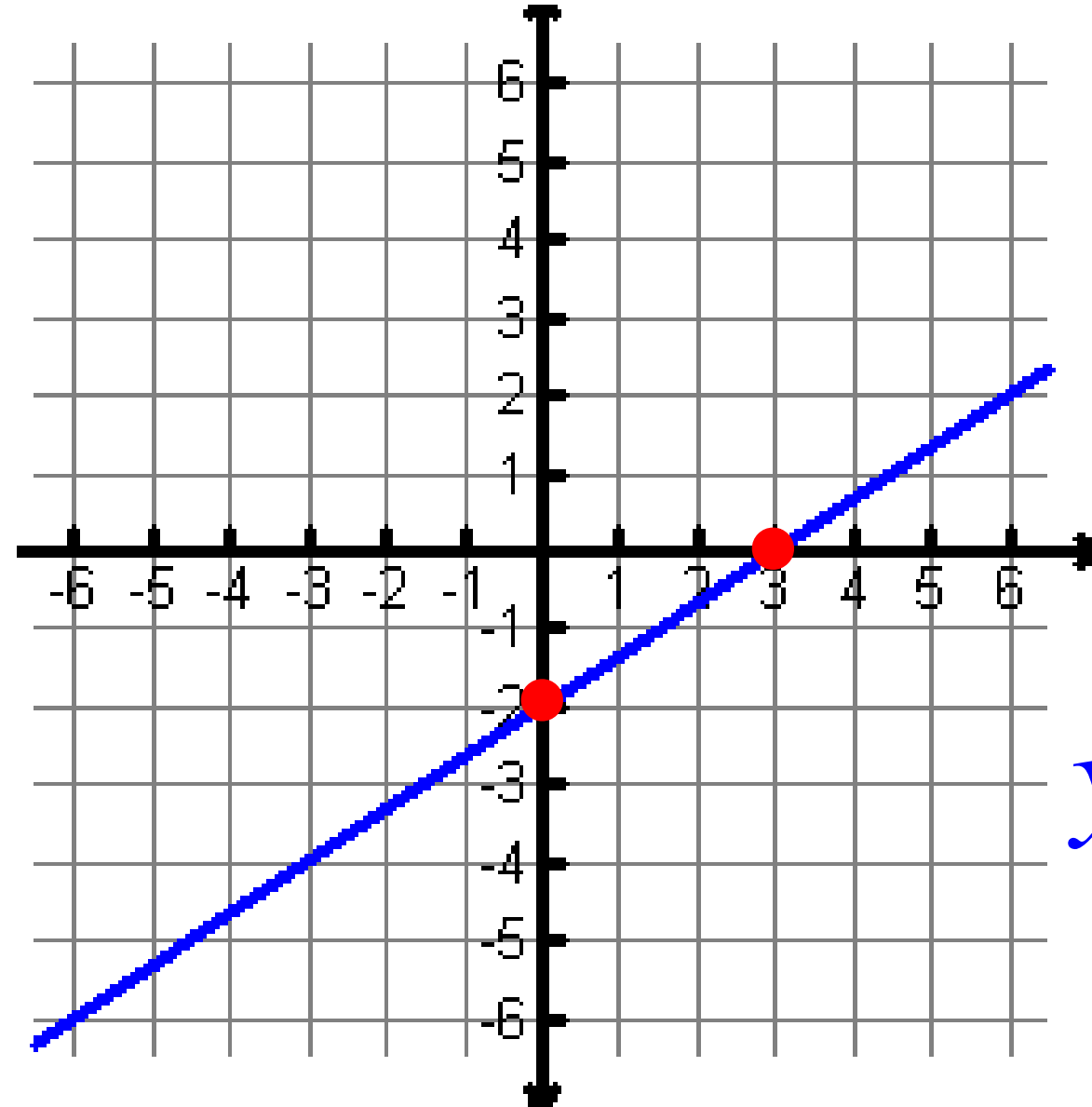
II. How to Write an Equation of a Line Given a Graph

1. Write down y = mx + b

2. Use any 2 "good" points on the graph to find the *slope, m.*

3. Find the *y-intercept on the graph, b.*

4. <u>Substitute</u> *slope* for *m* and *y-int* for *b* into the equation y = *m*x + *b*.

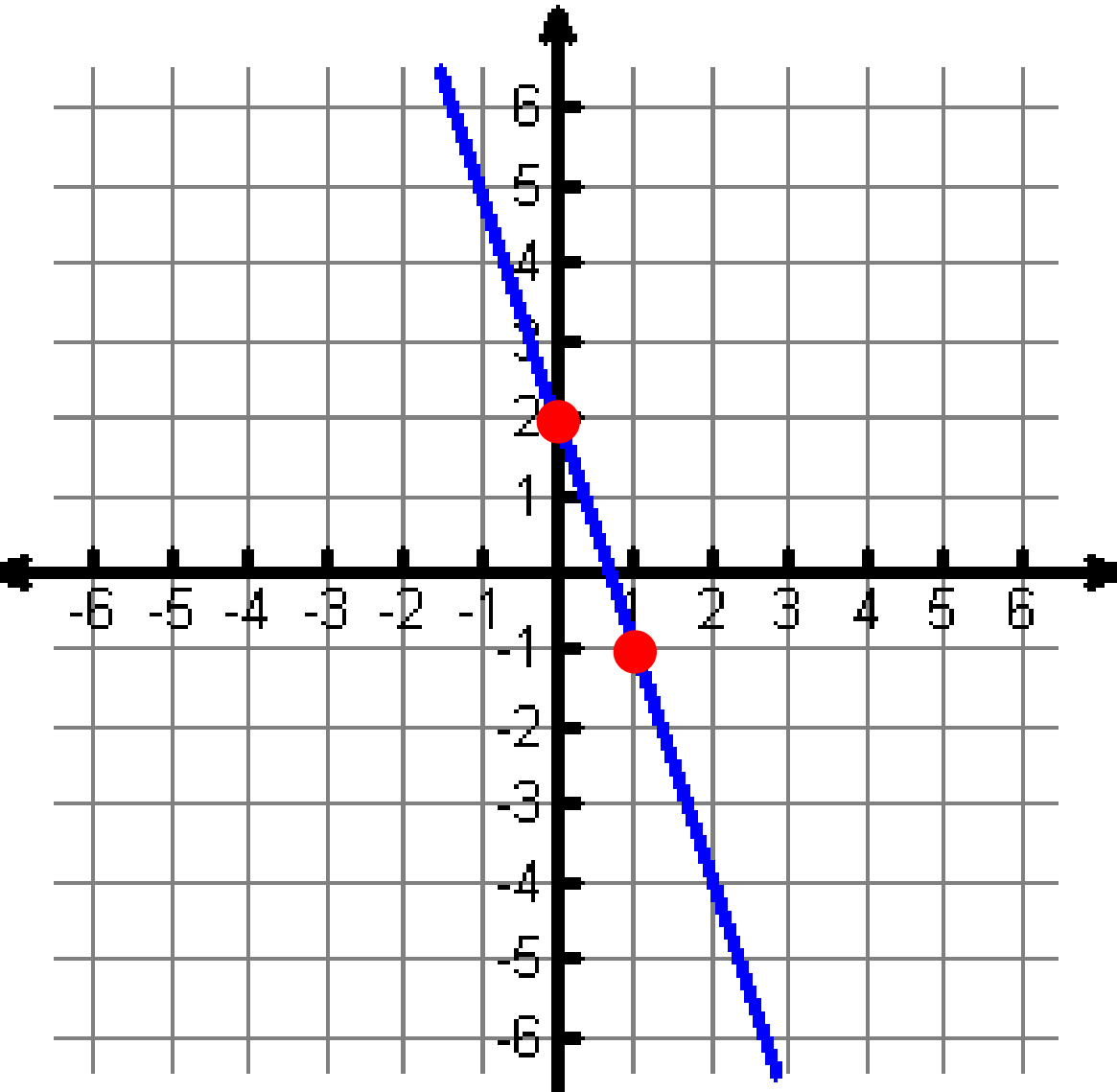# 6. Write the equation of this graph

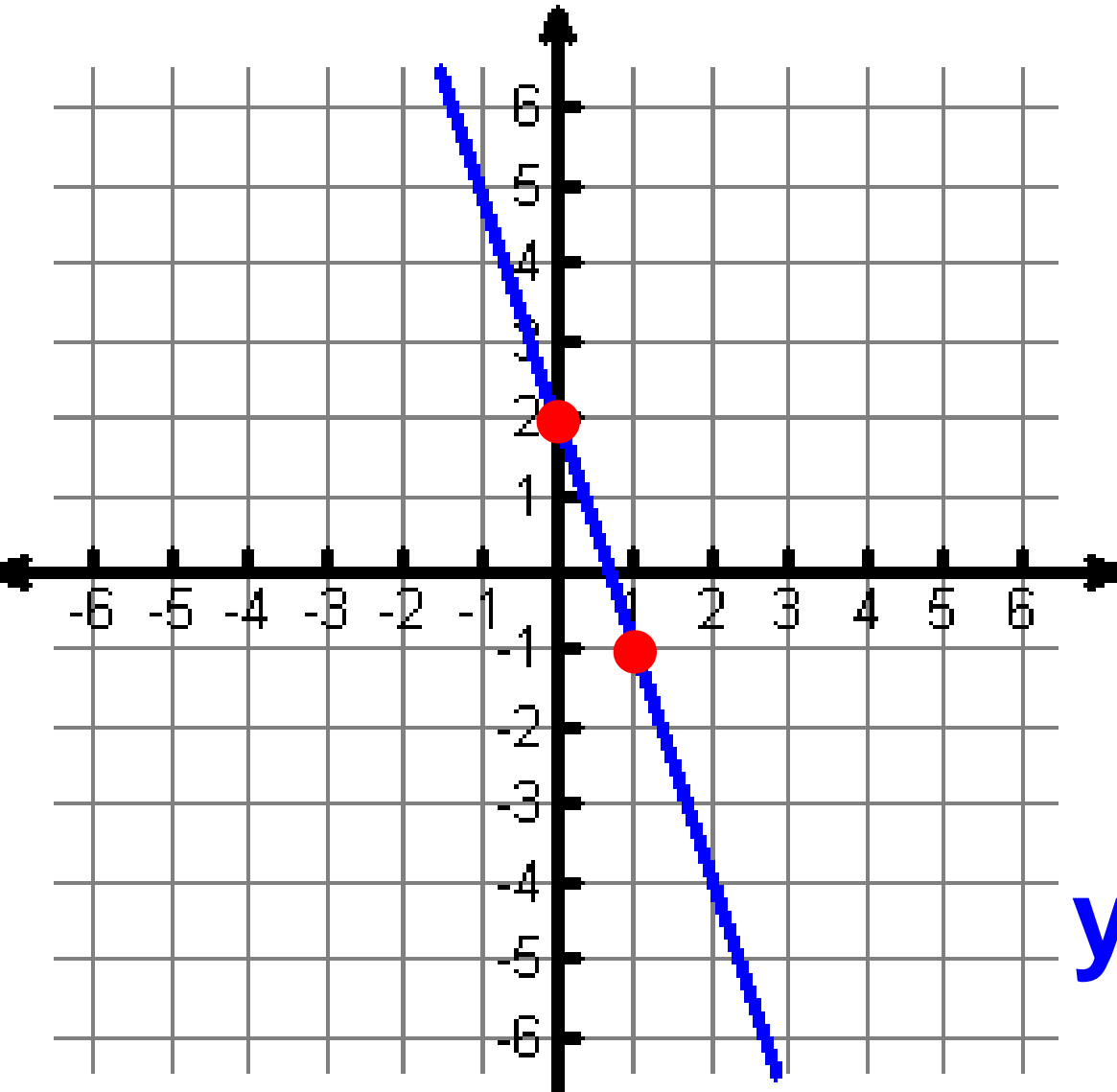# 6. Write the equation of this graph

$$y = \frac{2}{3}x - 2$$
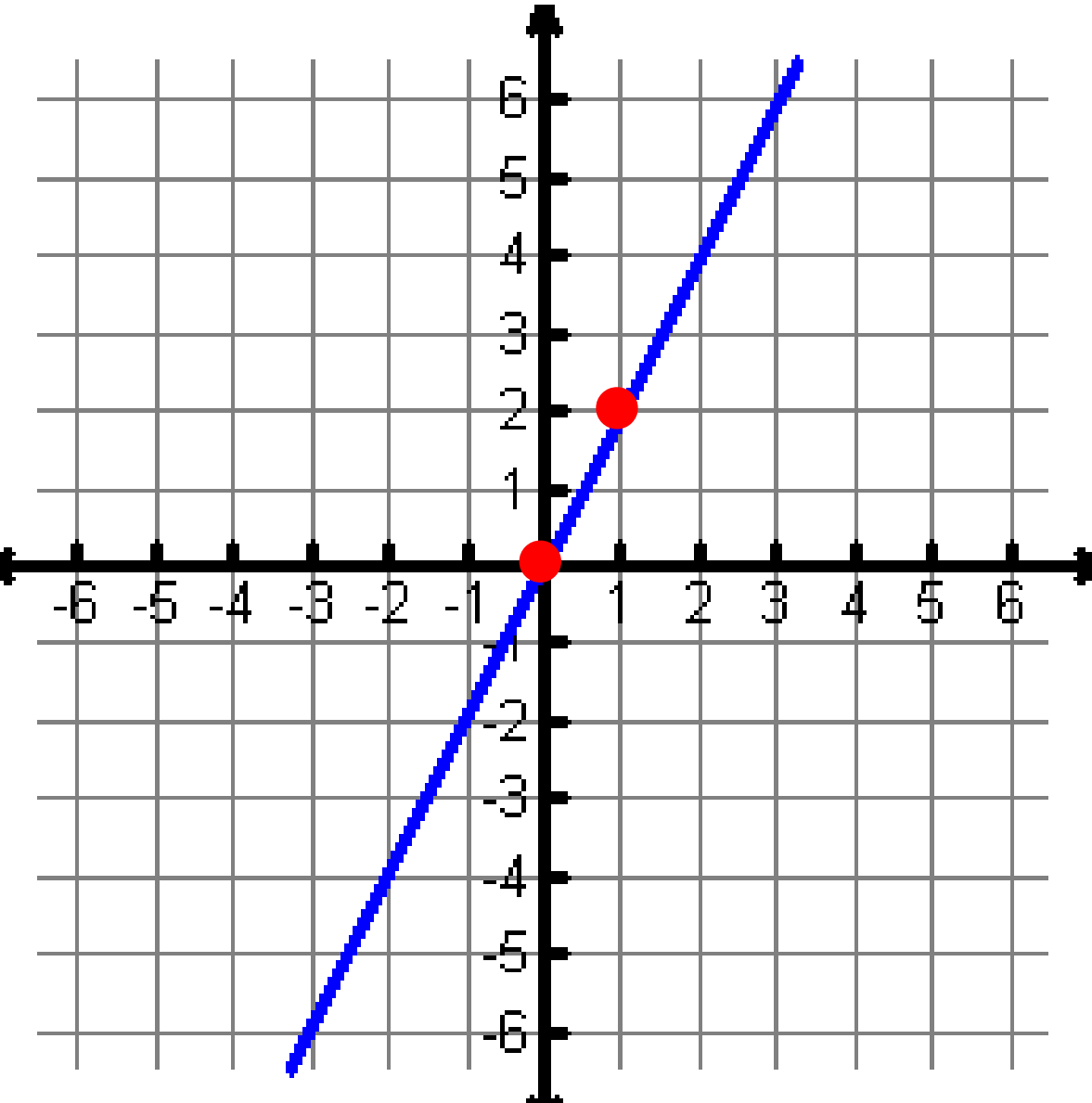
7. Write the equation of this graph
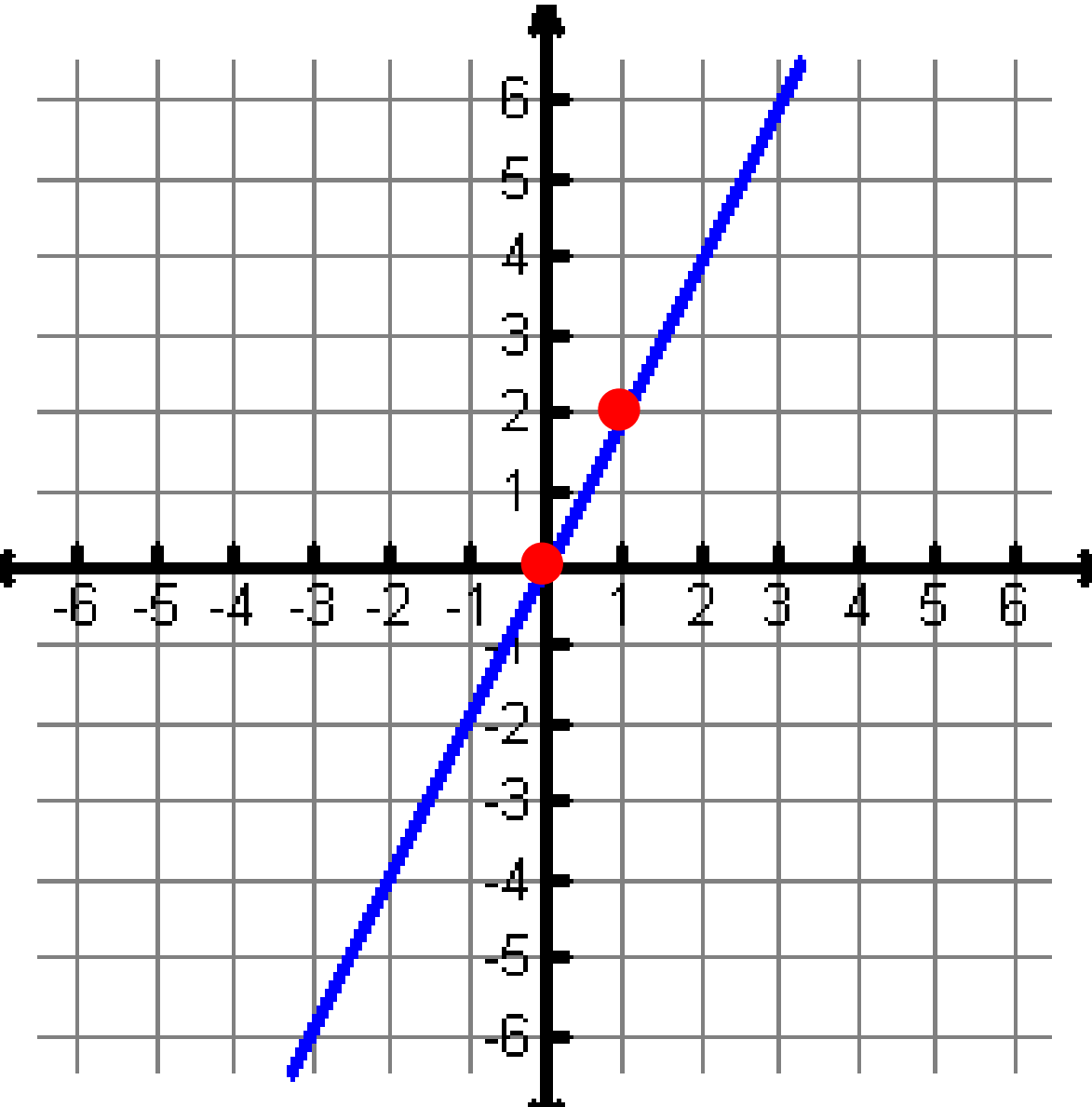
7. Write the equation of this graph

$$y = -3x + 2$$

8. Write the equation of this graph

8. Write the equation of this graph

$y = 2x$

9. Write the equation of this graph
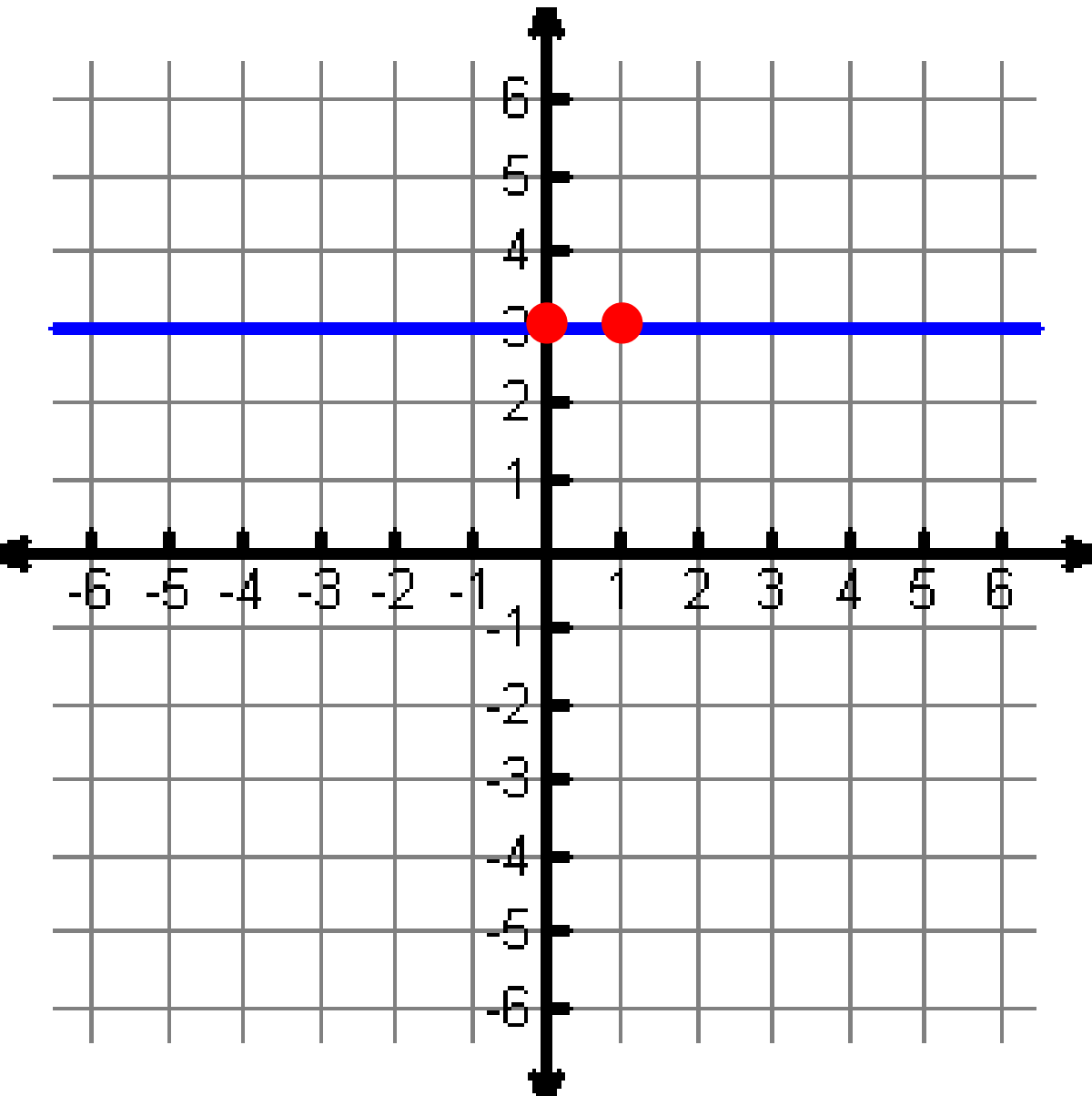
9. Write the equation of this graph
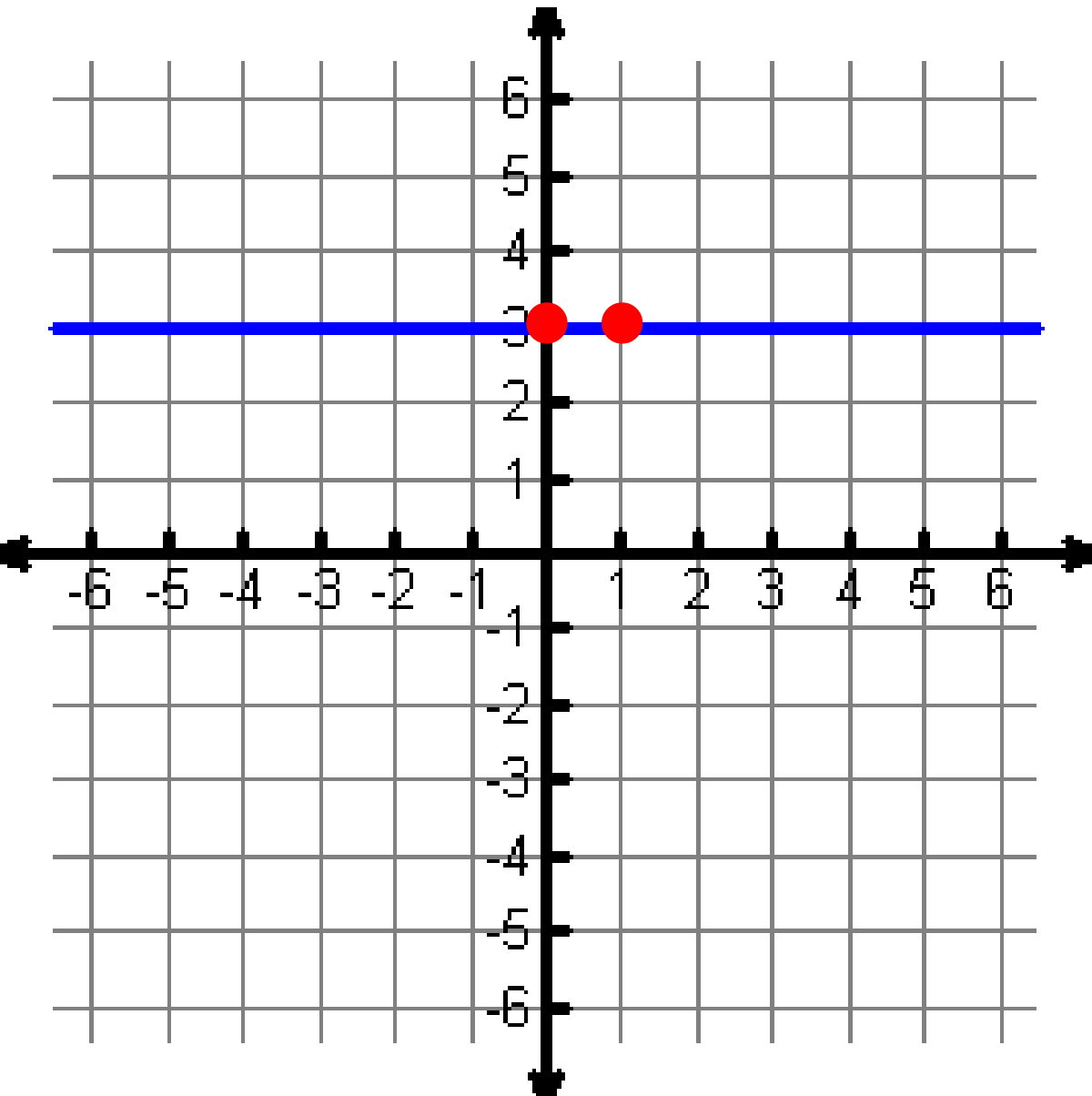
$y = 3$

10. Write the equation of this graph
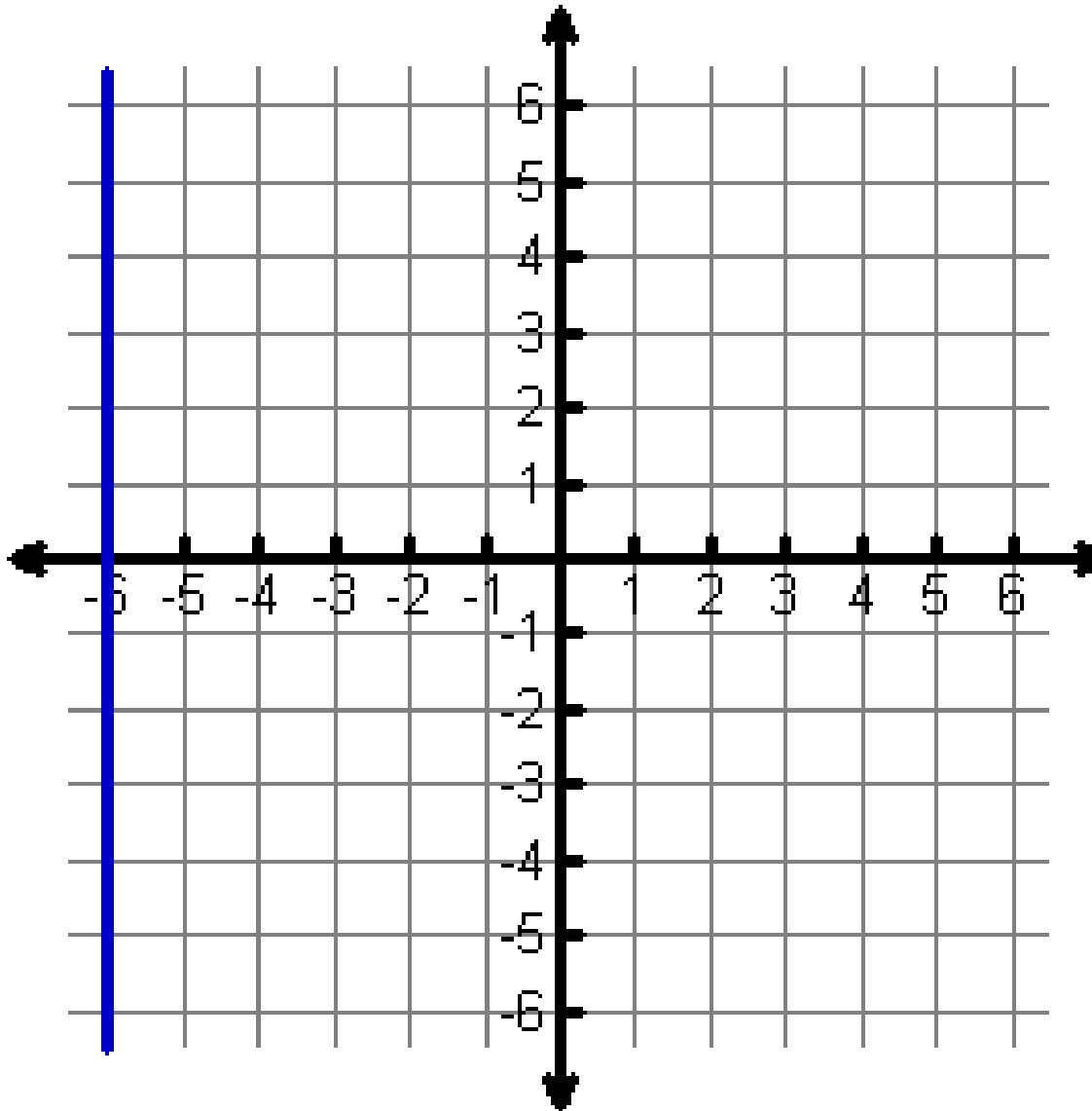
10. Write the equation of this graph
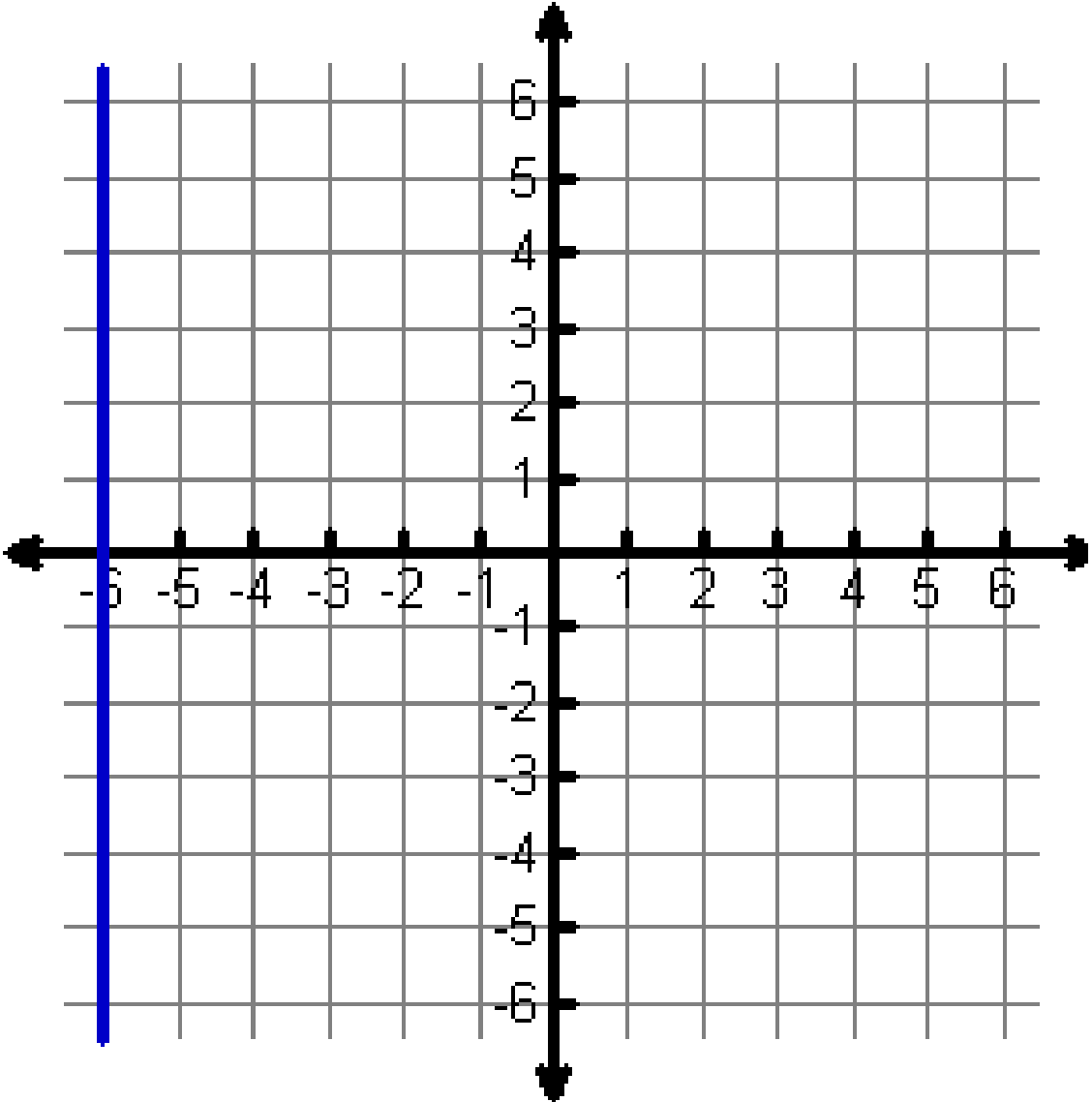
$x = -6$

III. How to Write an Equation of a Line Given *m* and a point

1. Write down y = mx + b.

2. Substitute slope for m and the point (x, y).

3. Solve for *b*.

4. Substitute m and b back into the equation.

Write the equation of the line given *m* and a point

Ex 13:   m = 2 Point: (2, 3)

$$y = mx + b$$

$$3 = 2(2) + b$$

$$b = -1$$

$$y = 2x - 1$$

<u>Write the equation of the line given *m* and a point</u>

Ex 14: **m =** **1/2** **Point: (4,-3)**

$$y = mx + b$$

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

$$b = -5$$

$$y = \frac{1}{2}x - 5$$

Write the equation of the line given *m* and a point

Ex: 16

m = 4   (1,4)

<u>Write the equation of the line given *m* and a point</u>

Ex: 16

m = 4   (1,4)

y = 4x

Write the equation of the line given *m* and a point

Ex: 18

m = 2   (0,3)

Write the equation of the line given *m* and a point

Ex: 18

m = 2   (0,3)

$$y = 2x + 3$$

Ex: 20

m = undefined   (3,6)

Write the equation of the line given *m* and a point

Ex: 20

m = undefined (3,6)

$$x = 3$$

IV. How to Write an Equation of a Line Given *TWO* points

1. Write down y = mx + b.

2. Use the slope formula to find *m*.

3. Pick one of the ordered pairs & substitute slope for m and the point (x, y).

4. Solve for *b*.

5. *Substitute m and b into the equation.*

Equation of a Line - Given 2 points

Ex: 21   (2, 3) (4, 5)

$$m = \frac{5-3}{4-2} = \frac{2}{2} = 1$$

y = mx + b

3 = 1(2) + b

b = 1

y = x + 1

Equation of a Line - Given 2 points

Ex: 22   (2, 3) (-4, 15)

Equation of a Line - Given 2 points

Ex: 22   (2, 3) (-4, 15)

$$m = \frac{15-3}{-4-2} = \frac{12}{-6} = -2$$

y = -2x + 7

Equation of a Line - Given 2 points

Ex: 23   (2, 2) (0, 4)

Equation of a Line - Given 2 points

Ex: 23   (2, 2) (0, 4)

$$m = \frac{4-2}{0-2} = \frac{2}{-2} = -1$$

y = -x + 4

PARALLEL LINES

- <u>Graphs:</u>   Lines Never Intersect and are in the same plane (coplanar)

- <u>Equations:</u>

    Same Slopes

    Different y-intercepts

PERPENDICULAR LINES

- Graphs: Lines Intersect at right angles (90° angles)

- Equations:

  Opposite (negative) Reciprocal Slopes

  With the same or different y-int

Find the Opposite (negative) Reciprocal Slopes

1. $-\dfrac{2}{3}$

2. $\dfrac{11}{12}$

3. 7

4. $-\dfrac{1}{9}$

Find the Opposite (negative) Reciprocal Slopes

1. $-\dfrac{2}{3}$ $\quad$ $\dfrac{3}{2}$

2. $\dfrac{11}{12}$ $\quad$ $-\dfrac{12}{11}$

3. 7 $\quad$ $-\dfrac{1}{7}$

4. $-\dfrac{1}{9}$ $\quad$ 9

Are these lines parallel, perpendicular, or neither?

1. $y = -2x + 1$

$y = -2x - 4$

2. $y = 3x - 4$

$y = -3x + 1$

3. $y = 1/5\ x + 2$

$y = -5x + 6$

Are these lines parallel, perpendicular, or neither?

1. $y = -2x + 1$

   $y = -2x - 4$

   parallel

2. $y = 3x - 4$

   $y = -3x + 1$

   neither

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

   $y = -5x + 6$

   perpendicular

Are these lines parallel, perpendicular, or neither?

4. $y = -2x + 1$

   $y = -1/2x - 4$

5. $y = 3x - 4$

   $y = 1 + 3x$

6. $y = 5/6\ x + 2$

   $y = -6/5\ x + 6$

Are these lines parallel, perpendicular, or neither?

4. $y = -2x + 1$

   $y = -1/2x - 4$

   neither

5. $y = 3x - 4$

   $y = 1 + 3x$

   parallel

6. $y = 5/6 \, x + 2$

   $y = -6/5 \, x + 6$

   perpendicular

How to Write an Equation of a Line PARALLEL to another and given a point

1. Given equation should be solved for y ($y = mx + b$)

2. Write down the slope of that line

3. Substitute m and (x, y) in $y = mx + b$.

4. Solve for b.

5. Write the equation using m and b.

Write a line parallel to the line 2x + y = 3 and passes through the point (-2, 5).

Write a line parallel to the line 2x + y = 3 and passes through the point (-2, 5).

$$y = -2x + 1$$

Write a line <u>parallel</u> to the line y = 3x – 5 and passes through the point (-5, -2).

Write a line <u style="color:red">parallel</u> to the line y = 3x – 5 and passes through the point (-5, -2).

$y = 3x + 13$

Write a line parallel to the line y = -4x + 1 and passes through the point (2, -1).

Write a line parallel to the line y = -4x + 1 and passes through the point (2, -1).

$$y = -4x + 7$$

Write a line parallel to the line y = -x – 7 and passes through the point (-4, -4).

Write a line parallel to the line y = -x – 7 and passes through the point (-4, -4).

$$y = -x - 8$$

1. Given equation should be solved for y ($y = mx + b$)

2. Write down the OPPOSITE RECIPROCAL slope of that line

3. Substitute m and (x, y) in $y = mx + b$.

4. Solve for b.

5. Write the equation using m and b.

Write a line [perpendicular](#) to the line y = ½ x – 2 and passes through the point (1, 0).

Write a line [perpendicular](#) to the line y = ½ x – 2 and passes through the point (1, 0).

y = -2x + 2

Write a line [perpendicular](#) to the line y = -3x + 2 and passes through the point (6, 5). Leave the equation in standard form.

Write a line **<u>perpendicular</u>** to the line y = -3x + 2 and passes through the point (6, 5). Leave the equation in standard form.

x - 3y = - 9

Write a line **perpendicular** to the line 2x + 3y = 9 and passes through the point (6, -1).

Write a line <u>perpendicular</u> to the line 2x + 3y = 9 and passes through the point (6, -1).

y = 3/2 x – 10

Write a line [perpendicular](#) to the line y = 2x – 1 and passes through the point (2, 4).

Write a line [perpendicular](#) to the line y = 2x – 1 and passes through the point (2, 4).

y = -1/2x + 5

Write a line **perpendicular** to

the line $y = -\dfrac{1}{3}x + 2$ and passes

through the point (5, 1). Leave

the equation in standard form.

Write a line **[perpendicular](#)** to the line $y = -\dfrac{1}{3}x + 2$ and passes through the point (5, 1). Leave the equation in standard form.

3x - y = 14