

4.5 – Equations of a Line

$$y = \textcircled{2}x - 3$$

$$y = \textcircled{\frac{1}{4}}x + 2$$

$$y = \textcircled{-3}x + 4$$

$$y = \textcircled{-\frac{1}{2}}x + 6$$

This always happens in linear equations which have only y on one side. This means we can graph the equation by plotting only *one* point and then using the slope to draw the line.

The easiest point to plot is the point whose x -coordinate is 0. You can see why by looking at the equation $y = 2x + 5$. When $x = 0$, then $y = 5$. So the point is $(0, 5)$.

This is the point where the graph crosses the y -axis. It is called the **y -intercept**. By just looking at the equation we can see both the slope and the y -intercept.

$$y = \textcircled{2}x + \textcircled{5}$$

slope
y-intercept

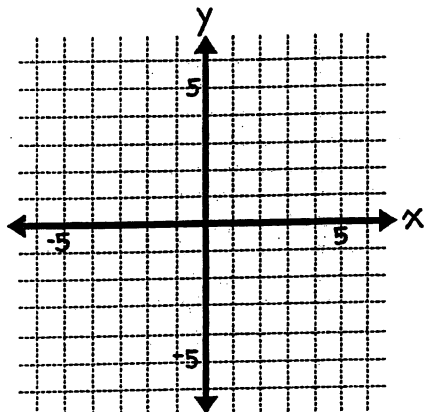
Write the slope and the y -intercept of the graph for each equation.

| | <i>slope</i> | <i>y-intercept</i> | | <i>slope</i> | <i>y-intercept</i> |
|------------------------|--------------|--------------------|------------------------|--------------|--------------------|
| $y = 5x + 2$ | _____ | _____ | $y = 2x - 7$ | _____ | _____ |
| $y = \frac{1}{3}x + 6$ | _____ | _____ | $y = 3x - 1$ | _____ | _____ |
| $y = \frac{3}{2}x + 9$ | _____ | _____ | $y = \frac{1}{5}x - 4$ | _____ | _____ |
| $y = \frac{1}{4}x + 4$ | _____ | _____ | $y = -2x + 6$ | _____ | _____ |
| $y = -9x + 1$ | _____ | _____ | $y = \frac{3}{4}x - 5$ | _____ | _____ |
| $y = 1x + 1$ | _____ | _____ | $y = -1x + 2$ | _____ | _____ |
| $y = x + 6$ | _____ | _____ | $y = -x - 10$ | _____ | _____ |
| $y = 2x + 0$ | _____ | _____ | $y = \frac{1}{3}x$ | _____ | _____ |
| $y = 2x$ | _____ | _____ | $y = \frac{5}{3}x$ | _____ | _____ |
| $y = -3x$ | _____ | _____ | | | |

Write the slope and y-intercept. Then plot the y-intercept and finish the graph by drawing a line through that point with the proper slope.

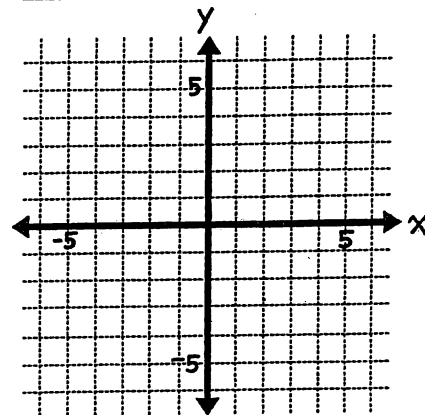
$$y = 2x - 5$$

slope: _____ y-intercept: _____



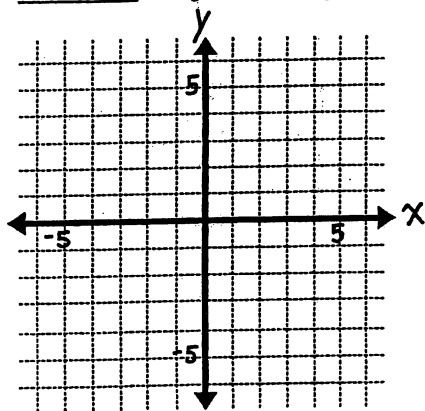
$$y = \frac{1}{3}x + 2$$

slope: _____ y-intercept: _____



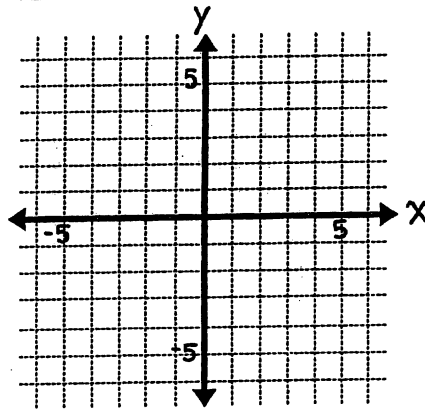
$$y = -\frac{2}{5}x + 1$$

slope: _____ y-intercept: _____



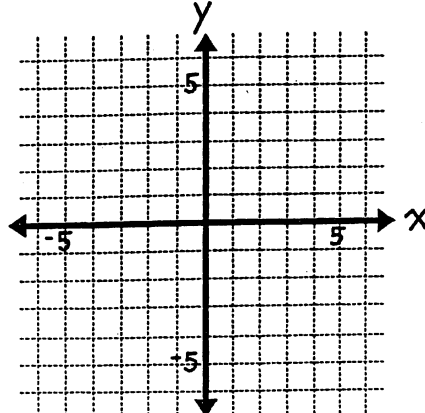
$$y = \frac{3}{4}x$$

slope: _____ y-intercept: _____



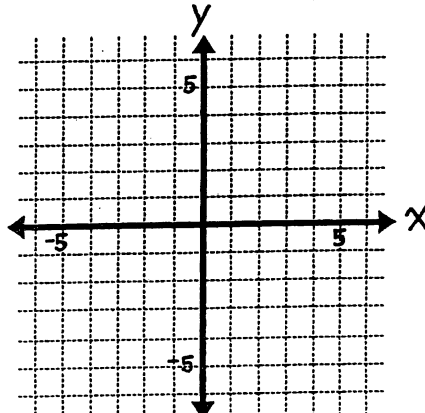
$$y = x - 3$$

slope: _____ y-intercept: _____



$$y = -x + 4$$

slope: _____ y-intercept: _____



Writing Linear Equations in the Form $y = mx + b$

If we want to use the slope and y -intercept to graph an equation like $4x + 3y = 6$, we first have to **solve the equation for y** . That means to find an equivalent equation in the form $y = mx + b$, where m is the slope and b is the y -intercept. To do that we use the Addition and Division Principles to get the y -term by itself on one side of the equation.

$$4x + 3y = 6$$

$$3y = -4x + 6$$

$$\frac{3y}{3} = \frac{-4x + 6}{3}$$

$$y = \frac{-4}{3}x + 2$$

Now we can see that the slope is $\frac{-4}{3}$ and the y -intercept is 2.

Solve each equation for y . Write the slope (m) and y -intercept (b) of the graph.

$$5x + 2y = 12$$

$$m = \underline{\hspace{2cm}} \quad b = \underline{\hspace{2cm}}$$

$$6x + 2y = 10$$

$$m = \underline{\hspace{2cm}} \quad b = \underline{\hspace{2cm}}$$

$$4y - 3x = 20$$

$$m = \underline{\hspace{2cm}} \quad b = \underline{\hspace{2cm}}$$

$$x + y = 8$$

$$m = \underline{\hspace{2cm}} \quad b = \underline{\hspace{2cm}}$$

$$x - 2y = 6$$

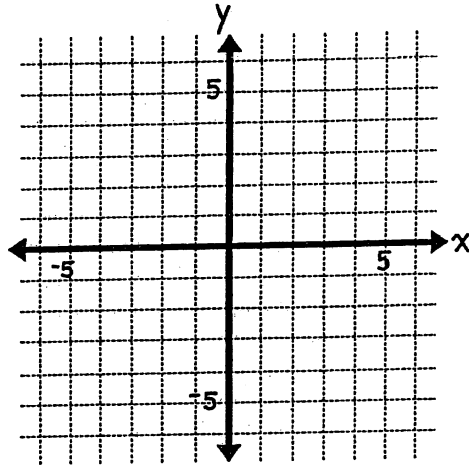
$$m = \underline{\hspace{2cm}} \quad b = \underline{\hspace{2cm}}$$

$$x + 3y = 15$$

$$m = \underline{\hspace{2cm}} \quad b = \underline{\hspace{2cm}}$$

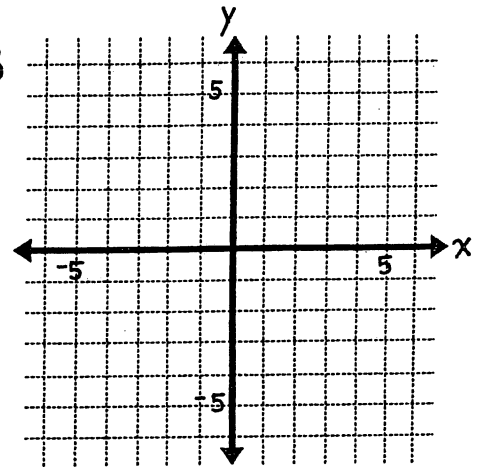
Solve each equation for y . Write the slope and y -intercept. Then use these to graph the equation.

$$2x + 3y = 12$$



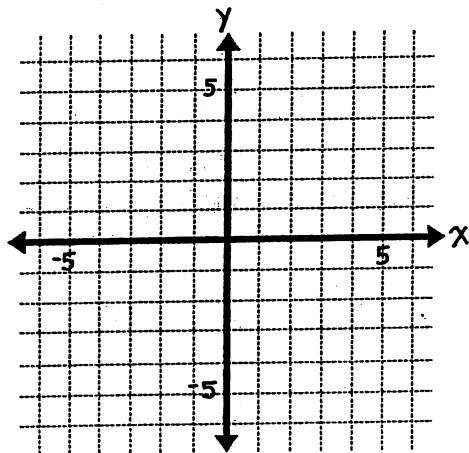
$$m = \underline{\hspace{2cm}} \quad b = \underline{\hspace{2cm}}$$

$$5x - 2y = 8$$



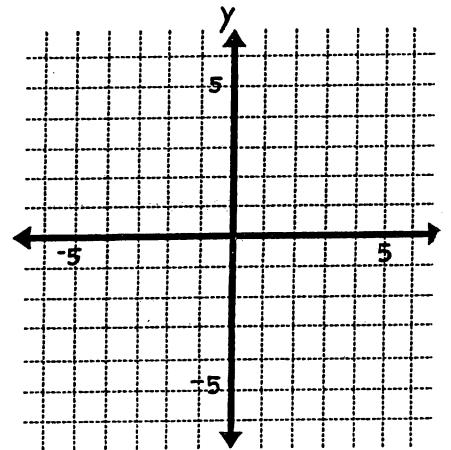
$$m = \underline{\hspace{2cm}} \quad b = \underline{\hspace{2cm}}$$

$$x + y = 3$$



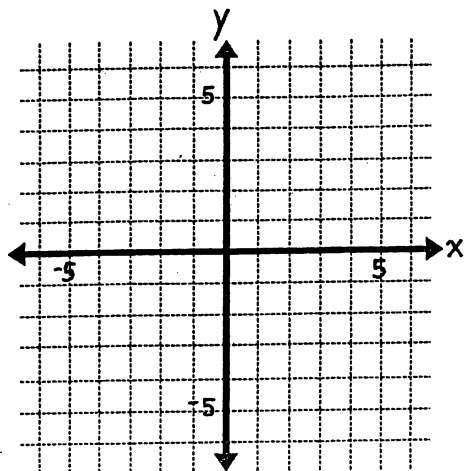
$$m = \underline{\hspace{2cm}} \quad b = \underline{\hspace{2cm}}$$

$$3x - y = 2$$



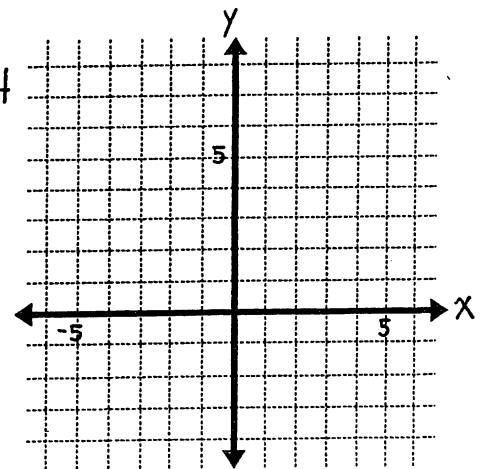
$$m = \underline{\hspace{2cm}} \quad b = \underline{\hspace{2cm}}$$

$$5x - 10y = 0$$



$$m = \underline{\hspace{2cm}} \quad b = \underline{\hspace{2cm}}$$

$$x - 4y = -24$$



$$m = \underline{\hspace{2cm}} \quad b = \underline{\hspace{2cm}}$$

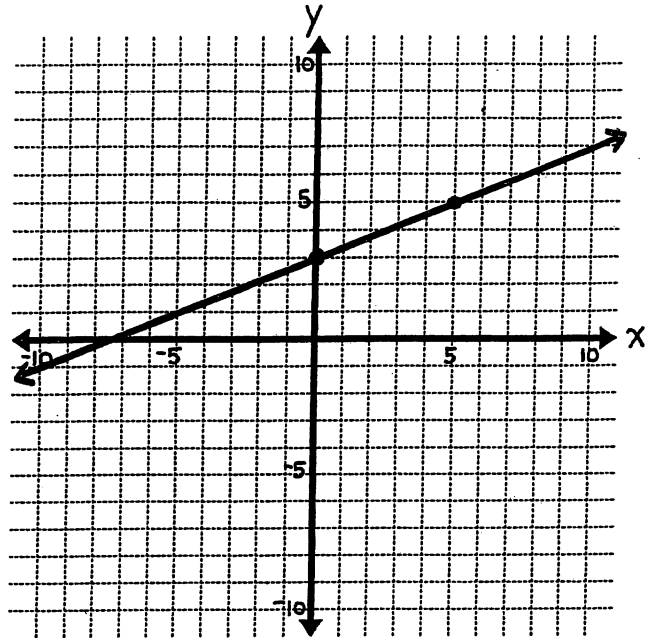
Finding the Equation of a Line

Every line is the graph of some linear equation. Can you guess the equation of the graph to the right?

Its slope is _____.

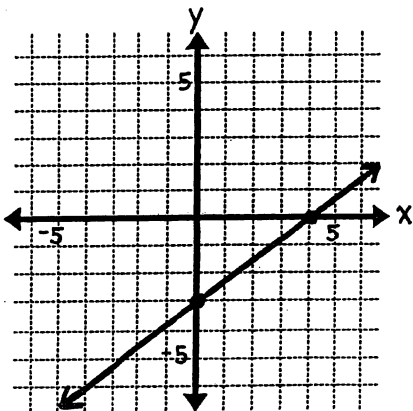
Its y -intercept is _____.

So its equation is $y = \underline{\hspace{1cm}}x + \underline{\hspace{1cm}}$.



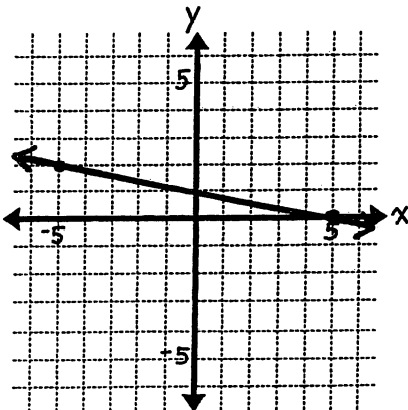
To write the equation for a line, we find its slope (m) and y -intercept (b). The equation is $y = mx + b$. In the graph above the slope is $\frac{2}{5}$ and the y -intercept is 3, so the equation is $y = \frac{2}{5}x + 3$.

For each line below find the slope and y -intercept. Then write the equation.



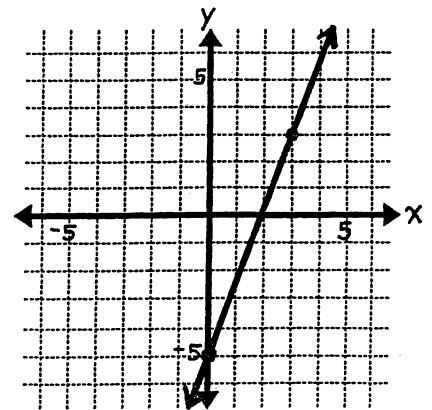
$m = \underline{\hspace{1cm}}$ $b = \underline{\hspace{1cm}}$

$y = \underline{\hspace{2cm}}$



$m = \underline{\hspace{1cm}}$ $b = \underline{\hspace{1cm}}$

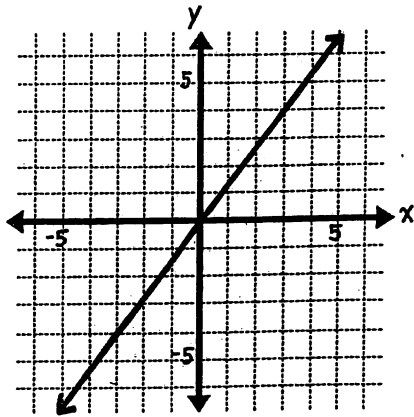
$y = \underline{\hspace{2cm}}$



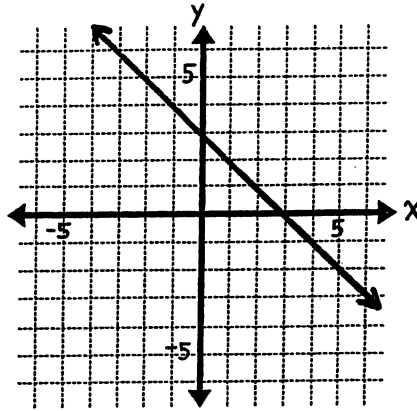
$m = \underline{\hspace{1cm}}$ $b = \underline{\hspace{1cm}}$

$y = \underline{\hspace{2cm}}$

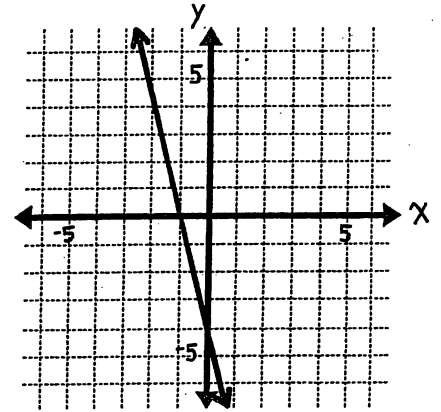
Write the equation of each line.



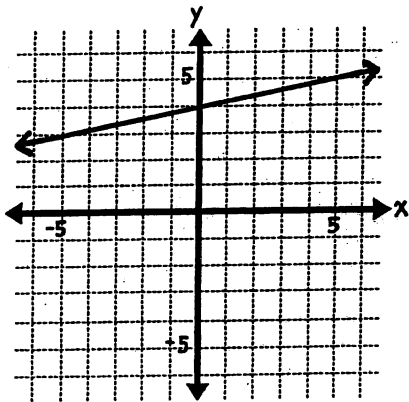
$y = \underline{\hspace{2cm}}$



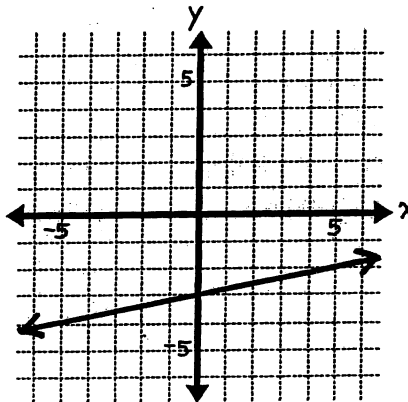
$y = \underline{\hspace{2cm}}$



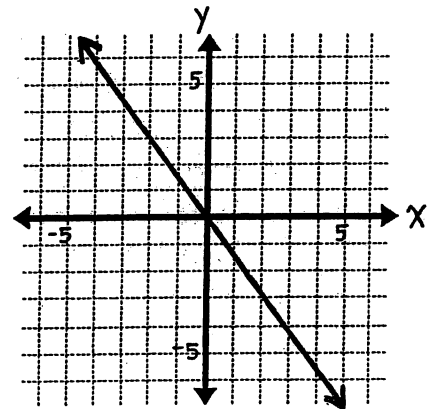
$y = \underline{\hspace{2cm}}$



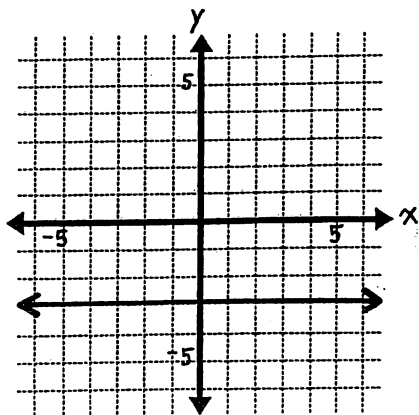
$y = \underline{\hspace{2cm}}$



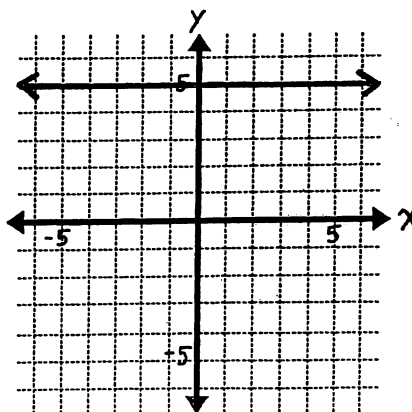
$y = \underline{\hspace{2cm}}$



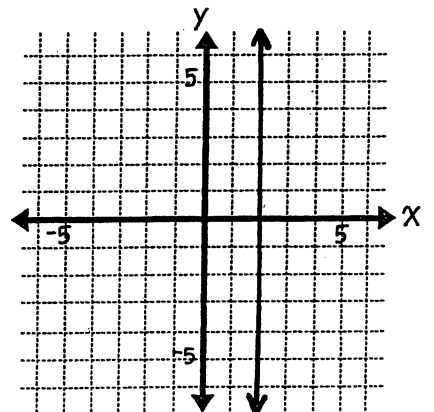
$y = \underline{\hspace{2cm}}$



$y = \underline{\hspace{2cm}}$



$y = \underline{\hspace{2cm}}$



$x = \underline{\hspace{2cm}}$