

Section 2.4  
Lines

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Special Equations

The graph the equation  $x = a$  is a vertical line thru  $(a, 0)$

The graph the equation  $y = b$  is a horizontal line thru  $(0, b)$

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Special Equations

Graph the equation  $y = 5$

Graph the equation  $y = -2$

Graph the equation  $x = 4$

Graph the equation  $x = -7$

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Special Equations

Graph the equation  $y = -15$

Graph the equation  $y = 12$

Graph the equation  $x = 14$

Graph the equation  $x = -72$

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The Slope of A Line

The slope of a line is given by the ratio

$$\frac{\text{change in } y}{\text{change in } x} = \frac{\Delta y}{\Delta x} = \frac{\text{rise}}{\text{run}}$$

The slope of the line containing the points

$(x_1, y_1)$  and  $(x_2, y_2)$  is given by

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1}$$

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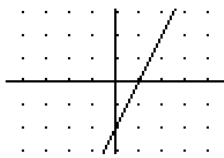
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Find the slope of the line shown below.



Find the change in  $y$  and the change in  $x$ .

$$\text{Slope} = \frac{\text{change in } y}{\text{change in } x} = \frac{2}{1} = 2$$

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Find the slope of the line shown below.



Find the change in  $y$  and the change in  $x$ .

$$\text{Slope} = \frac{\text{change in } y}{\text{change in } x} = \frac{-3}{1} = -3$$

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Find the slope of the line shown below.



Find the change in  $y$  and the change in  $x$ .

$$\text{Slope} = \frac{\text{change in } y}{\text{change in } x} = \frac{2}{3}$$

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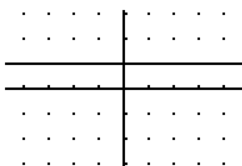
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Find the slope of the line shown below.



Find the change in  $y$  and the change in  $x$ .

$$\text{Slope} = \frac{\text{change in } y}{\text{change in } x} = \frac{0}{1} = 0$$

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Find the slope of the line shown below.



Find the change in y and the change in x.

$$\text{Slope} = \frac{\text{change in } y}{\text{change in } x} = \frac{1}{0} \text{ undefined}$$

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Find the slope of the line thru  
(3, 2) and (5, 6).

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6 - 2}{5 - 3} = \frac{4}{2} = 2$$

Look at the graph of this line to see

that the  $\frac{\text{rise}}{\text{run}}$  is always 2 units.

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Find the slope of the line thru  
(2, 3) and (6, 5).

$$\text{slope} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - 3}{6 - 2} = \frac{2}{4} = \frac{1}{2}$$

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Find the slopes of the lines through each of the ordered pairs.

$$(4,1) \text{ and } (-2,-3)$$

$$(-2,4) \text{ and } (6,-7)$$

$$(-10,3) \text{ and } (-10,4)$$

$$(-1,3) \text{ and } (-2,3)$$

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Use your calculator to graph the following equations using the standard window.

$$y = 0 \cdot x + 1$$

$$y = x + 1$$

$$y = 3x + 1$$

$$y = 2x + 1$$

$$y = 4x + 1$$

What effect does changing the value of  $m$  in  $y = mx + 1$  have on the graph of the equation.

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Use your calculator to graph the following equations using the standard window.

$$y = -x + 1$$

$$y = -2x + 1$$

$$y = -3x + 1$$

What does the graph of the line  $y = mx + 1$  look like if  $m$  is a negative value?

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Use your calculator to graph the following equations using the standard window.

$$y = 2x + 0$$

$$y = 2x - 3$$

$$y = 2x + 4$$

$$y = 2x - 5$$

What effect does changing the value of  $b$  in  $y = 2x + b$  have on the graph of the equation.

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#### The Slope-Intercept Equation

The equation  $y = mx + b$  is called the slope-intercept equation.

The slope of the line is given by  $m$ .

The y-intercept is given by  $(0, b)$ .

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Find the slopes and y - intercepts of each of the following :

$$y = 3x + 1$$

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

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

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Graph each of the following :

$$y = 3x + 1$$

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

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

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### The Point-Slope Equation

Given the point  $(x_1, y_1)$  and a slope  $m$ ,

The point-slope equation of the line is given by

$$y - y_1 = m(x - x_1)$$

How do we get this equation?

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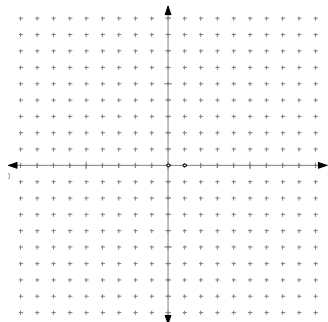
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Find the equation of the line thru  
(3, 2) with slope 3.

$$y - 2 = 3(x - 3)$$

$$y - 2 = 3x - 9$$

$$y = 3x - 7$$

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Find the point-slope equation of  
the line thru (-2, 1) with slope -2  
the line thru (1, -1) with slope -5  
the line thru (-2, -4) with slope  $-\frac{1}{2}$

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Describe the graph of each equation.

$$y - 1 = 2(x - 2)$$

$$y + 2 = -3(x + 1)$$

$$y - 2 = \frac{1}{2}(x - 4)$$

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Graph each equation.

$$y + 2 = 3(x - 2)$$

$$y - 4 = -\frac{1}{2}(x + 2)$$

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

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