

# Determining the Equation of a Line in Slope-Intercept Form

Point  
(x, y)

$$y = m x + b$$

↑ slope
↑ y-intercept

① Slope = 2  
y-intercept = -8

$$y = 2x + -8$$

② Slope = -2  
passes through (3, 5)

$$y = mx + b$$

$$5 = -2 \cdot 3 + b$$

$$5 = -6 + b$$

$$b = 11$$

$$y = -2x + 11$$

③ Slope =  $\frac{1}{3}$   
passes through (0, -2)

Because x=0, -2 is b.

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

④ Passes through (3, -1) (6, 7)

1st Find m...  $\frac{\Delta y}{\Delta x}$

$$m = \frac{-1 + 7}{3 + 6} = \frac{-8}{-3} = \frac{8}{3}$$

$$m = \frac{8}{3}$$

2nd Pick one point, calculate b

Picked (6, 7)

$$y = mx + b$$

$$7 = \frac{8}{3} \cdot 6 + b$$

$$7 = 16 + b$$

$$b = -9$$

$$y = \frac{8}{3}x + -9$$

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## Determining an Equation of a Line

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**Objective:** To find an equation of a line given the slope and one point on the line, or given two points on the line.

**Example 1** Write an equation of a line that has slope 3 and y-intercept 2.

**Solution** Substitute 3 for  $m$  and 2 for  $b$  in  $y = mx + b$ .  
The equation is  $y = 3x + 2$ .

Write an equation in slope-intercept form of each line described.

- slope 2; y-intercept 3
- slope -4; y-intercept 2
- slope  $\frac{1}{2}$ ; y-intercept 5
- slope  $\frac{1}{3}$ ; y-intercept 6
- slope  $-\frac{1}{2}$ ; y-intercept 4
- slope  $-\frac{1}{4}$ ; y-intercept 4
- slope  $\frac{2}{3}$ ; y-intercept -6
- slope 3; y-intercept -7
- slope -5; y-intercept 2
- slope  $-\frac{2}{5}$ ; y-intercept -1

**Example 2** Write an equation of a line that has slope -2 and passes through (5, 0).

**Solution**

- Substitute -2 for  $m$  in  $y = mx + b$   
 $y = -2x + b$
- To find  $b$ , substitute 5 for  $x$  and 0 for  $y$  in  $y = -2x + b$ .  
 $y = -2x + b$   
 $0 = -2(5) + b$   
 $0 = -10 + b$   
 $10 = b$

The equation is  $y = -2x + 10$ .

Write an equation in slope-intercept form of each line described.

- slope 2; passes through (3, -1)
- slope 3; passes through (-1, 2)
- slope -4; passes through (2, 3)
- slope -2; passes through (-3, 1)
- slope  $\frac{2}{3}$ ; passes through (0, 3)
- slope  $-\frac{4}{3}$ ; passes through (1, 0)
- slope  $-\frac{3}{5}$ ; passes through (-1, -4)
- slope -1; passes through (3, 1)
- slope 0; passes through  $(\frac{1}{4}, 2)$
- slope 0; passes through  $(-2, \frac{3}{8})$

**Determining an Equation of a Line** (continued)

**Example 3** Write an equation of the line passing through the points  $(-3, 2)$  and  $(1, -2)$ .

**Solution**

1. Find the slope: 
$$\frac{y_2 - y_1}{x_2 - x_1} = \frac{-2 - 2}{1 - (-3)}$$
$$= \frac{-4}{4} = -1$$

Substitute  $-1$  for  $m$  in  $y = mx + b$ .

$$y = -x + b$$

2. Choose one of the points, say  $(-3, 2)$ .

Substitute  $-3$  for  $x$  and  $2$  for  $y$ .

$$y = -x + b$$

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

$$2 = 3 + b$$

$$-1 = b$$

The equation is  $y = -x - 1$ .

Write an equation in slope-intercept form of the line passing through the given points.

21.  $(4, 5), (2, 1)$

22.  $(-1, 2), (4, 7)$

23.  $(1, 2), (4, 4)$

24.  $(3, 4), (4, 6)$

25.  $(3, 1), (5, 2)$

26.  $(0, -2), (-3, 2)$

27.  $(0, -1), (-2, 3)$

28.  $(6, 4), (2, 1)$

29.  $(-2, 8), (1, 2)$

30.  $(0, 3), (-1, 0)$

31.  $(-1, 3), (2, 0)$

32.  $(1, -7), (2, -1)$