

**Example 2** Find an equation of each line described.

- The line through  $(1, 2)$  and parallel to the line  $y = 3x - 7$
- The line through  $(1, 2)$  and perpendicular to the line  $y = 3x - 7$
- The line through the points  $(-3, 0)$  and  $(1, 8)$

**Solution**

- If the line is parallel to the line  $y = 3x - 7$ , its slope must be 3. Substituting in  $y - y_1 = m(x - x_1)$  gives  $y - 2 = 3(x - 1)$ , or  $y = 3x - 1$ .
- The required line has slope  $-\frac{1}{3}$ . (Why?) Thus an equation in point-slope form is  $y - 2 = -\frac{1}{3}(x - 1)$ , or  $y = -\frac{1}{3}x + \frac{7}{3}$ , or  $x + 3y = 7$ .
- First find the slope:  $m = \frac{8 - 0}{1 - (-3)} = 2$   
Then use the point-slope form with *either* given point.  
Using  $(-3, 0)$ , the equation is  $y - 0 = 2[x - (-3)]$ , or  $y = 2x + 6$ .  
Using  $(1, 8)$ , the equation is  $y - 8 = 2(x - 1)$ , or  $y = 2x + 6$ .

## Classroom Exercises

Give an equation of each line described.

- Slope  $= -\frac{1}{2}$ ; y-intercept  $= 5$
- Slope  $= \frac{3}{7}$ ; y-intercept  $= 8$
- x-intercept  $= 2$ ; y-intercept  $= 4$
- x-intercept  $= 2$ ; y-intercept  $= -6$
- The x-axis
- The y-axis
- y-intercept  $= -3$ ; parallel to  $y = -\frac{4}{5}x + 2$
- y-intercept  $= 0$ ; perpendicular to  $y = -\frac{7}{4}x + 9$
- Slope  $= \frac{5}{8}$ ; passes through  $(3, 4)$
- Slope  $= -2$ ; passes through  $(8, 6)$

State the slope of the line and name two points on the line.

- $y = -(x + 7)$
- $y + 2 = \frac{1}{2}(x - 5)$
- $y - c = \frac{a}{b}(x - d)$
- Line  $l$  is tangent to  $\odot O$  at point  $P(3, 4)$ .
  - Find the radius of the circle.
  - Give an equation of the circle.
  - Find the slope of line  $l$ .
  - Give an equation of line  $l$ .

