

SECTION 2.4 Point Slope Form of Equations

$$\text{Slope is } m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$$

$$y = mx + b$$

SLOPE-INTERCEPT FORM

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

POINT-SLOPE FORM

- 1) Write the equation of the line, with the given properties, in slope-intercept form.

Slope = -6, through (-3, 2)

Plug slope, x and y (from the point) into the equation to find b

$$y = mx + b$$

$$2 = -6(-3) + b$$

$$2 = 18 + b \text{ move 18 to left and subtract it}$$

$$-16 = b \text{ then rewrite the equation using slope and b}$$

$y = -6x - 16$

- 2) Find a point-slope equation of the line having the given slope and containing the given point.

$$m = \frac{6}{7}, (7, 5)$$

What is an equation of the line?

In the equation below, type the slope appropriate positions.

$y - 5 = \frac{6}{7}(x - 7)$

$$y = mx + b$$

- 3) Find a **point-slope equation** of the line having the given slope and containing the given point.

$$m = \frac{3}{4}, (5, 4)$$

$$y = mx + b$$

slope (pointing to m)
y-intercept (pointing to b)

What is an equation of the line?

In the equation below, type the slope and the coordinates of the point in the appropriate positions.

$$y - 4 = \frac{3}{4}(x - 5)$$

- 4) Find a **point-slope equation** of the line having the given slope and containing the given point.

$$m = \frac{2}{3}, (8, 6)$$

$$y = mx + b$$

slope (pointing to m)
y-intercept (pointing to b)

What is an equation of the line?

In the equation below, type the slope and the coordinates of the point in the appropriate positions.

$$y - 6 = \frac{2}{3}(x - 8)$$

- 5) Write in **point-slope form an equation** of the line through the pair of points (4,0) and (14,8).

Type an equation of the line in point-slope form using one of the given points.

$$\text{SLOPE} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{8 - 0}{14 - 4} = \frac{8}{10} = \frac{4}{5}$$

Then use 1st point (4,0)

$$y - 0 = \frac{4}{5}(x - 4)$$

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

slope (pointing to m)
coordinates of a point on the line (pointing to y_1 and x_1)

$$y = \frac{4}{5}(x - 4)$$

- 6) Write in **point-slope form an equation** of the line through the pair of points (3,0) and (18,6).

Type an equation of the line in point-slope form using one of the given points.

$$\text{SLOPE} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{6 - 0}{18 - 3} = \frac{6}{15} = \frac{2}{5}$$

Then use 1st point (3,0)

$$y - 0 = \frac{2}{5}(x - 3)$$

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

coordinates of a point on the line

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

- 7) Write in **point-slope form an equation** of the line through the pair of points (4,0) and (9,2).

Type an equation of the line in point-slope form using one of the given points.

$$\text{SLOPE} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{2 - 0}{9 - 4} = \frac{2}{5} = \frac{2}{5}$$

Then use 1st point (4,0)

$$y - 0 = \frac{2}{5}(x - 4)$$

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

coordinates of a point on the line

$$y = \frac{2}{5}(x - 4)$$

- 8) Write in **point-slope form an equation** of the line through the pair of points (3,0) and (9,5).

Type an equation of the line in point-slope form using one of the given points.

$$\text{SLOPE} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{5 - 0}{9 - 3} = \frac{5}{6}$$

Then use 1st point (3,0)

$$y - 0 = \frac{5}{6}(x - 3)$$

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

coordinates of a point on the line

$$y = \frac{5}{6}(x - 3)$$

- 9) Write in point-slope form an equation of the line through the pair of points.

(9,4) and (3,11)

Slope is $m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$

What is an equation of the line in point-slope form?

A. $x - 4 = -\frac{7}{6}(y - 9)$

B. $y - 4 = \frac{7}{6}(x - 9)$

C. $y - 4 = -\frac{7}{6}(x - 9)$

D. $y = \frac{7}{6}x + \frac{29}{2}$

Diagram illustrating the point-slope form equation: $y - y_1 = m(x - x_1)$. The variable m is labeled as "slope". The variables x_1 and y_1 are labeled as "coordinates of a point on the line".

- 10) Write in point-slope form an equation of the line through the pair of points.

(9,4) and (3,11)

Slope is $m = \frac{\text{rise}}{\text{run}} = \frac{y_2 - y_1}{x_2 - x_1}$

What is an equation of the line in point-slope form?

A. $x - 4 = -\frac{7}{6}(y - 9)$

B. $y - 4 = \frac{7}{6}(x - 9)$

C. $y - 4 = -\frac{7}{6}(x - 9)$

D. $y = \frac{7}{6}x + \frac{29}{2}$

Diagram illustrating the point-slope form equation: $y - y_1 = m(x - x_1)$. The variable m is labeled as "slope". The variables x_1 and y_1 are labeled as "coordinates of a point on the line".

9) Write in point-slope form an equation of the line through the pair of points.

(2,4) and (7,12)

Type an equation of the line in point-slope form using one of the given points.

$$\text{SLOPE} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{12 - 4}{7 - 2} = \frac{8}{5}$$

Then use 1st point (2,4)

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

$$y - 4 = \frac{8}{5}(x - 2)$$

10) Write in point-slope form an equation of the line through the pair of points.

(3,9) and (5,4)

Type an equation of the line in point-slope form using one of the given points.

$$\text{SLOPE} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{4 - 9}{5 - 3} = \frac{-5}{2} = -\frac{5}{2}$$

Then use 1st point (3,9)

$$y - 9 = -\frac{5}{2}(x - 3)$$

Parallel Lines

PARALLEL LINES

SAME SLOPE

$$m = \frac{3}{5} \quad || \quad m = \frac{3}{5}$$

Perpendicular Lines

PERPENDICULAR LINES

OPPOSITE SLOPE

$$m = \frac{3}{5} \quad \perp \quad m = -\frac{5}{3}$$

*change sign and take reciprocal

(x, y)

m

11) Find an equation of the line through (4,8) and parallel to $y = 3x - 5$. same slope $m = 3$

$$y = mx + b$$

$$8 = 3(4) + b$$

$$8 = 12 + b \quad \text{move 12 to left}$$

$$-4 = b \quad \text{then rewrite the equation using slope and b}$$

$$y = mx + b$$

$$y = 3x - 4$$

 (x, y)

m

12) Find an equation of the line through (1,7) and parallel to $y = 2x + 4$. same slope $m = 2$

$$y = mx + b$$

$$7 = 2(1) + b$$

$$7 = 2 + b \quad \text{move 2 to left}$$

$$5 = b \quad \text{then rewrite the equation using slope and b}$$

$$y = mx + b$$

$$y = 2x + 5$$

13) Write in point-slope form an equation of the line through the pair of points (4,0) and (16,10).

Type an equation of the line in point-slope form using one of the given points.

$$\text{SLOPE} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{10 - 0}{16 - 4} = \frac{10}{12} = \frac{5}{6}$$

Then use 1st point (4,0)

$$y - 0 = \frac{5}{6}(x - 4)$$

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

$$y = \frac{5}{6}(x - 4)$$

14) Write in point-slope form an equation of the line through the pair of points.

(2,10) and (5,3)

Type an equation of the line in point-slope form using one of the given points.

$$\text{SLOPE} = \frac{y_2 - y_1}{x_2 - x_1} = \frac{3 - 10}{5 - 2} = \frac{-7}{3} = -\frac{7}{3}$$

Then use 1st point (2,10)

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

$$y - 10 = \frac{7}{3}(x - 2)$$

PARALLEL LINES

SAME SLOPE

$$m = \frac{3}{5} \quad || \quad m = \frac{3}{5}$$

PERPENDICULAR LINES

OPPOSITE SLOPE

$$m = \frac{3}{5} \quad \perp \quad m = -\frac{5}{3}$$

*change sign and take reciprocal

15) Write the equation of the line through the given point. Use slope-intercept form.

(x, y) m

(-5, 8); perpendicular to $y = -\frac{6}{5}x - 5$

Flip and change the sign $m = \frac{5}{6}$

$$y = mx + b$$

$$8 = \frac{5}{6}(-5) + b$$

$$8 = -\frac{25}{6} + b \quad \text{add } \frac{25}{6} \text{ to 8 in calculator to get } b$$

$$\frac{73}{6} = b \quad \text{then rewrite the equation using slope and } b$$

$$y = mx + b$$

$$y = \frac{5}{6}x + \frac{73}{6}$$

16) Write in point-slope form an equation of the line through the pair of points.

(5,11) and (3,6)

$$\text{SLOPE} = \frac{6-11}{3-5} = \frac{-5}{-2}$$

Then use 1st point (5,11)

What is an equation of the line in point-slope form?

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

B. $x - 11 = \frac{5}{2}(y - 5)$

C. $y - 11 = -\frac{5}{2}(x - 5)$

D. $y - 11 = \frac{5}{2}(x - 5)$

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

17) Find an equation of the line through (4,7) and parallel to $y = 4x + 8$.

same slope $m = 4$

$$y = mx + b$$

$$7 = 4(4) + b$$

$$7 = 16 + b \quad \text{move 12 to left}$$

$$-9 = b \quad \text{then rewrite the equation using slope and } b$$

$$y = mx + b$$

$$y = 4x - 9$$

PARALLEL LINES

SAME SLOPE

$$m = \frac{3}{5} \quad \parallel \quad m = \frac{3}{5}$$

PERPENDICULAR LINES

OPPOSITE SLOPE

$$m = \frac{3}{5} \quad \perp \quad m = -\frac{5}{3}$$

*change sign and take reciprocal

18) Write the equation of the line through the given point. Use slope-intercept form.

(x, y) m
 $(-5, 7)$; perpendicular to $y = -\frac{5}{4}x - 3$

Flip and change the sign $m = \frac{4}{5}$

$$y = mx + b$$

$$7 = \frac{4}{5}(-5) + b$$

$$7 = -4 + b \quad \text{add 7 to 7 in calculator to get b}$$

$$11 = b \quad \text{then rewrite the equation using slope and b}$$

$$y = mx + b$$

$$y = \frac{4}{5}x + 11$$

19) Write an equation in slope-intercept form of the line that passes through the given point and is perpendicular to the graph of the given equation.

(x, y) m
 $(-4, 3)$; $y = \frac{1}{4}x - 5$

change sign, reciprocal, reciprocal $m = -4$,

$$y = mx + b$$

$$3 = (-4)(-4) + b$$

$$3 = 16 + b \quad \text{move 16 to left}$$

$$-13 = b \quad \text{then rewrite the equation using slope and b}$$

$$y = mx + b$$

$$y = -4x - 13$$

20) Write an equation in slope-intercept form of the line that passes through the given point and is parallel to the graph of the given equation.

(x, y) m
 $(-4, -7); y = -3x + 1$

same slope $m = 3$

$$y = mx + b$$

$$-7 = (-3)(-4) + b$$

$$-7 = 12 + b \quad \text{move 12 to left}$$

$$-19 = b \quad \text{then rewrite the equation using slope and b}$$

$$y = mx + b$$

$$y = -3x - 19$$

21) Write an equation in slope-intercept form of the line that passes through the given point and is perpendicular to the graph of the given equation.

(x, y) m
 $(-5, 3); y = \frac{1}{5}x - 3$

change sign, reciprocal, reciprocal $m = -5$

$$y = mx + b$$

$$3 = (-5)(-5) + b$$

$$3 = 25 + b \quad \text{move 25 to left}$$

$$-22 = b \quad \text{then rewrite the equation using slope and b}$$

$$y = mx + b$$

$$y = -5x - 22$$

22) Write an equation in slope-intercept form of the line that passes through the given point and is perpendicular to the graph of the given equation.

(x, y) m
 $(-3, 4); y = \frac{1}{3}x - 2$

change sign, reciprocal, reciprocal $m = -3$

$$y = mx + b$$

$$4 = (-3)(-3) + b$$

$$4 = 9 + b \text{ move 9 to left}$$

$$-5 = b$$

then rewrite the equation using slope and b

$$y = mx + b$$

$$y = -3x - 5$$