

Standard and Point-Slope Form of a Line

Standard Form - use when asked to write the equation of a line in standard form

$$Ax + By = C$$

$$2x - 3y = 10$$

$$Ax + By = C$$

$$A = 2 \quad B = -3 \quad C = 10$$

Is in standard form

$$-5x - y = 9$$

$$\frac{-5x}{-1} - \frac{1y}{-1} = \frac{9}{-1}$$

$$\boxed{5x + y = -9}$$

$$A = -5$$

$$B = -1$$

$$C = 9$$

Slope-Intercept Form - use when asked to graph a line

$$y = 3x - 1$$

$$y = mx + b$$

$$m = \frac{3}{1} \uparrow 3 \quad b = -1$$

$$(0, -1)$$

$$y = mx + b$$

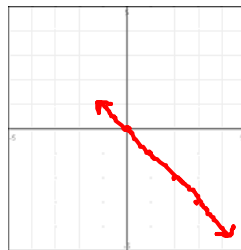
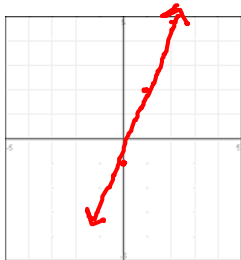
slope \uparrow y -int. \uparrow

$$y = -x$$

$$y = mx + b$$

$$m = \frac{-1}{1} \downarrow 1 \quad b = 0$$

$$(0, 0)$$



Point-Slope Form - use when asked to write the equation of a line

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

$m = \text{slope}$ (x_1, y_1) point on the line

Given: $m = \frac{1}{2}$, $(x_1, y_1) = (4, -3)$

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

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

$$y + 3 = \frac{1}{2}(x - 4)$$

Given: $(x_1, y_1) = (-5, 2)$, $(x_2, y_2) = (4, -3)$

$$m = \frac{y_2 - y_1}{x_2 - x_1} = \frac{-3 - 2}{4 - (-5)} = \frac{-5}{9}$$

$$m = -\frac{5}{9} \quad (x_1, y_1) = (-5, 2)$$

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

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

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

1. Write each equation in standard form and in slope-intercept form. Identify the slope and the y-intercept.

a) $6y = -2x - 13$

$+2x + 2x$

$2x + 6y = -13$

Standard Form

$Ax + By = C$

$2x + 6y = -13$

Slope-Intercept Form

$y = mx + b$

$\frac{6y}{6} = \frac{-2x}{6} - \frac{13}{6}$

$y = -\frac{1}{3}x - \frac{13}{6}$

$m = -\frac{1}{3}$

$b = -\frac{13}{6}$

y-int: $(0, -13/6)$

b) $3x + 5y + 7 = 0$

Standard Form

$3x + 5y + 7 = 0$

$-7 -7$

$3x + 5y = -7$

Slope-Int. Form

$3x + 5y + 7 = 0$

$-5y -5y$

$3x + 7 = -5y$

$\frac{-5y}{-5} = \frac{3x + 7}{-5}$

$y = -\frac{3}{5}x - \frac{7}{5}$

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

$b = -\frac{7}{5}$

y-int: $(0, -7/5)$

c) $3x = 7y$

Standard Form

$$\begin{array}{r} 3x = 7y \\ -7y \quad -7y \end{array}$$

$$\boxed{3x - 7y = 0}$$

Slope-Intercept Form

$$3x = 7y$$

$$\frac{y}{7} = \frac{3x}{7}$$

$$\boxed{y = \frac{3}{7}x}$$

$$\boxed{m = \frac{3}{7}}$$

$$b = 0$$

$$\boxed{y\text{-int: } (0, 0)}$$

d) $6x - 8 = 2y + 1$

Standard Form

$$\begin{array}{r} 6x - 8 = 2y + 1 \\ +8 \quad \quad +8 \end{array}$$

$$\begin{array}{r} 6x = 2y + 9 \\ -2y \quad -2y \end{array}$$

$$\boxed{6x - 2y = 9}$$

Slope-Int. Form

$$6x - 8 = 2y + 1$$

$$\begin{array}{r} 2y + 1 = 6x - 8 \\ +1 \quad \quad -1 \end{array}$$

$$\frac{2y}{2} = \frac{6x - 9}{2}$$

$$\boxed{y = 3x - \frac{9}{2}}$$

$$\boxed{m = 3}$$

$$b = -\frac{9}{2}$$

$$\boxed{y\text{-int: } (0, -\frac{9}{2})}$$

e) $x = \frac{2}{5}y + 7$

Standard Form

$$5 \cdot \frac{x}{5 \cdot 1} = \frac{2}{5}y + \frac{7 \cdot 5}{1 \cdot 5}$$

LCD = 5

$$\frac{5x}{5} = \frac{2y}{5} + \frac{35}{5}$$

$$\rightarrow 5x = 2y + 35$$

$$-2y \quad -2y$$

$$5x - 2y = 35$$

Slope-Int. Form

$$5x = 2y + 35$$

$$2y + 35 = 5x$$

$$-35 \quad -35$$

$$\frac{2y}{2} = \frac{5x - 35}{2}$$

$$y = \frac{5}{2}x - \frac{35}{2}$$

$$m = \frac{5}{2}$$

$$b = -\frac{35}{2}$$

$$y\text{-int: } (0, -\frac{35}{2})$$

2. Write an equation in slope-intercept form for the line that contains the given point and the given slope.

a) $m = -4, (-2, -5)$ $y - y_1 = m(x - x_1)$ x_1, y_1

$$y - (-5) = -4(x - (-2))$$

$$y + 5 = -4(x + 2)$$

$$y + 5 = -4x - 8$$

$$-5 \quad -5$$

$$y = -4x - 13$$

b) $m = \frac{1}{3}, (2, -4)$ x_1, y_1

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

$$y + 4 = \frac{1}{3}(x - 2)$$

$$\frac{1}{3} \cdot \frac{2}{1} = \frac{2}{3}$$

$$y + 4 = \frac{1}{3}x - \frac{2}{3}$$

$$-4 \quad -4$$

$$y = \frac{1}{3}x - \frac{14}{3}$$

$$-\frac{2}{3} + \frac{-4 \cdot 3}{1 \cdot 3}$$

LCD = 3

$$-\frac{2}{3} + \frac{-12}{3} = -\frac{14}{3}$$

c) $m = 0, (1, 7)$

horizontal line

$$y = c$$

$$y = 7$$

d) $m = \text{undefined}, (0, -4)$

vertical line

$$x = c$$

$$x = 0$$

3. Write an equation in slope-intercept form for the line that contains the given points.

a) $(-7, -3), (6, 8)$ $m = \frac{y_2 - y_1}{x_2 - x_1}$

$$m = \frac{8 - (-3)}{6 - (-7)}$$

$$m = \frac{11}{13}$$

$$y - (-3) = \frac{11}{13}(x - (-7))$$

$$y + 3 = \frac{11}{13}(x + 7)$$

$$y + 3 = \frac{11}{13}x + \frac{77}{13}$$

$$y + 3 = \frac{11}{13}x + \frac{77}{13}$$

$$y + 3 = \frac{11}{13}x + \frac{77}{13}$$

$$y = \frac{11}{13}x + \frac{38}{13}$$

$$\frac{77}{13} - \frac{3 \cdot 13}{1 \cdot 13}$$

LCO = 13

$$\frac{77 - 39}{13} = \frac{38}{13}$$

b) $(0, -4), (4, 2)$ $m = \frac{y_2 - y_1}{x_2 - x_1}$

$$m = \frac{2 - (-4)}{4 - 0} = \frac{6}{4} = \frac{3}{2}$$

$$m = \frac{3}{2} \quad (0, -4)$$

$$b = -4$$

$$y = mx + b$$

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

c) $(0, 8), (2, 8)$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{8 - 8}{2 - 0} = \frac{0}{2}$$

$m = 0$ horiz. line

$$y = c$$

$$y = 8$$

d) $(-3, 4), (-3, 7)$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \frac{7 - 4}{-3 - (-3)} = \frac{3}{0}$$

$m = \text{undefined}$ vertical line

$$x = c$$

$$x = -3$$