

# Equations of Lines Notes

Name KEY

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

(Problems 1 - 3) Directions: Find the slope of the line passing through the following points.

1) (-3, 2) and (5, 6)

$$m = \frac{6 - 2}{5 - (-3)} = \frac{4}{8} = \frac{1}{2}$$

2) (4, 3) and (1, 2)

$$m = \frac{2 - 3}{1 - 4} = \frac{-1}{-3} = \frac{1}{3}$$

3) (-1, -4) and (2, -1)

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

Slope Intercept Form	Standard Form
<p>Use this form when you know the slope and the <math>y</math>-intercept (where the line crosses the <math>y</math>-axis).</p> $y = mx + b$ <p style="text-align: center;"> <math>\uparrow</math> slope      <math>\uparrow</math> <math>y</math>-int         </p>	<p>Change to this form from slope intercept form</p> $Ax + By = C$ <p><math>A</math>, <math>B</math>, and <math>C</math> are <u>integers</u></p> <p>In Standard Form, there should be NO FRACTIONS, and the coefficient <math>A</math> should NEVER be negative!</p>
Horizontal Lines	Vertical Lines
<p><math>y = \text{any number}</math></p> <p>Lines that are horizontal have <u>zero</u> slope!</p> <p>Horizontal lines have "run" but NO "rise"</p>	<p><math>x = \text{any number}</math></p> <p>Lines that are vertical have no slope (it does not exist so it is <u>undefined</u>)</p> <p>Vertical lines have "rise" but NO "run"</p> <p>Zero in the denominator means <u>undefined</u></p>

**Practice Problems:**

**1. Write the slope-intercept form of the equation of each line given the slope and y-intercept.**

a) Slope = 5, y - intercept = -3

$$y = 5x - 3$$

b) Slope = 0, y - intercept = 2

$$y = 2$$

c) Slope = -1, y - intercept = 5

$$y = -x + 5$$

d) Slope =  $-\frac{1}{3}$ , y - intercept = 5

$$y = -\frac{1}{3}x + 5$$

**2. Write the slope intercept form of the equation of the line through the given point with the given slope.**

a) through (5, 3) slope =  $\frac{4}{5}$

$$3 = \frac{4}{5}(5) + b$$

$$3 = 4 + b$$

$$b = -1$$

$$y = \frac{4}{5}x - 1$$

b) through (-3, -2) slope =  $-\frac{2}{3}$

$$-2 = -\frac{2}{3}(-3) + b$$

$$-2 = 2 + b$$

$$b = -4$$

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

c) through (7, 2) slope = -2

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

$$2 = -14 + b$$

$$b = 16$$

$$y = -2x + 16$$

d) through (-1, -4) slope = -4

$$-4 = -4(-1) + b$$

$$-4 = 4 + b$$

$$b = -8$$

$$y = -4x - 8$$

**3. Write the slope intercept form of the equation of the line through the given points.**

a) through: (-5, -5) and (1, -3)  $m = \frac{-3 - (-5)}{1 - (-5)} = \frac{2}{6} = \frac{1}{3}$  b) through: (4, 3) and (1, 2)  $m = \frac{3 - 2}{4 - 1} = \frac{1}{3}$

$$-3 = \frac{1}{3}(1) + b$$

$$-3 = \frac{1}{3} + b$$

$$b = -\frac{10}{3}$$

$$y = \frac{1}{3}x - \frac{10}{3}$$

$$2 = \frac{1}{3}(1) + b$$

$$b = \frac{5}{3}$$

$$y = \frac{1}{3}x + \frac{5}{3}$$

c) through (2, 2) and (4, 2)  $m = \frac{2 - 2}{4 - 2} = \frac{0}{2} = 0$

$$y = 2$$

d) through (3, 5) and (-1, -4)  $m = \frac{5 - (-4)}{3 - (-1)} = \frac{9}{4}$

$$5 = \frac{9}{4}(3) + b$$

$$5 = \frac{27}{4} + b$$

$$b = -\frac{7}{4}$$

$$y = \frac{9}{4}x - \frac{7}{4}$$

4. Write the standard form of the equation of each line given the slope and y-intercept.

a) Slope = -2, y-intercept = -2

$$y = -2x - 2$$

$$2x + y = -2$$

b) Slope =  $-\frac{1}{5}$ , y-intercept = -4

$$y = -\frac{1}{5}x - 4$$

$$5 \left( \frac{1}{5}x + y = -4 \right)$$

$$x + 5y = -20$$

c) through: (-4, 4), slope =  $-\frac{7}{4}$

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

$$4 = 7 + b$$

$$-3 = b$$

$$y = -\frac{7}{4}x - 3$$

$$4 \left( \frac{7}{4}x + y = -3 \right)$$

$$7x + 4y = -12$$

d) through: (1, 2), slope = 6

$$2 = 6(1) + b$$

$$b = -4$$

$$y = 6x - 4$$

$$-1 \left( -6x + y = -4 \right)$$

$$6x - y = 4$$

5. Change the following equations from slope - intercept form to standard form. REMEMBER: The coefficient A should NOT be NEGATIVE! NO FRACTIONS!!

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

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

$$5x - 4y = 20$$

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

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

$$x - 2y = -6$$

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

$$3 \left( \frac{2}{3}x + y = 2 \right)$$

$$2x + 3y = 6$$

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

$$-2 \left( -\frac{7}{2}x + y = 5 \right)$$

$$7x - 2y = -10$$