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Worksheet 6-1: Standard Form of Linear Equations

Forms of Linear Equations

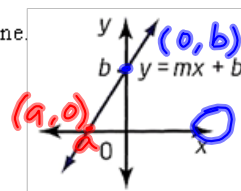
Linear equations can be expressed in many different forms. The two common forms are:

(i) **Standard Form:** $Ax + By + C = 0$,
where A, B, C are integers. A and B are not both zero, A is positive.

(ii) **Slope-Intercept Form:** $y = mx + b$

where m is the slope of the line, and b is the y -intercept of the graph of the line.

The y -intercept " b " is the y -coordinate of the point at which the line cuts the y -axis. It is the value of the dependent variable " y " when the independent variable " x " is 0.



$A \rightarrow +ve$ $Ax + By + C = 0$

1. Write each linear equation in standard form, and state its x - and y -intercepts.

(a) $y = 3x - 6$ $b = y$ -intercept $= -6$

$$\begin{array}{r} -y - y \\ \hline 0 = 3x - y - 6 \\ 3x - y - 6 = 0 \text{ - standard form} \\ x = ? \quad y = 0 \\ 3x - (0) - 6 = 0 \\ 3x - 6 = 0 \\ +6 \quad +6 \\ \hline 3x = 6 \\ \frac{3x}{3} = \frac{6}{3} \\ x = 2 \end{array}$$

x -intercept $x = 2$

(c) $y = -6x + 12$

$$\begin{array}{r} +6x + 6x \\ \hline 6x + y = 12 \\ -12 \quad -12 \\ \hline 6x + y - 12 = 0 \\ x = ? \quad y = 0 \\ 6x - 12 = 0 \\ +12 \quad +12 \\ \hline 6x = 12 \\ \frac{6x}{6} = \frac{12}{6} \\ x = 2 \end{array}$$

y -intercept is 12

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

$$\begin{array}{r} 2(y) = 2\left(\frac{1}{2}x + 3\right) \\ 2y = 2\left(\frac{1}{2}x\right) + 2(3) \\ 2y = x + 6 \\ 0 = x - 2y + 6 \text{ standard form} \\ x - 2y + 6 = 0 \rightarrow \\ x + 6 = 0 \\ x = -6 \end{array}$$

x -intercept $= -6$

(d) $y = -\frac{3}{4}x - 9$

$$\begin{array}{r} 4(y) = 4\left(-\frac{3}{4}x - 9\right) \\ 4y = 4\left(-\frac{3}{4}x\right) - 4(9) \\ 4y = -3x - 36 \\ +3x \quad +3x \\ \hline 4y + 3x = -36 \\ +36 \quad +36 \\ \hline 3x + 4y + 36 = 0 \\ x = ? \quad y = 0 \\ 3x + 36 = 0 \\ -36 \quad -36 \\ \hline 3x = -36 \\ \frac{3x}{3} = \frac{-36}{3} \\ x = -12 \end{array}$$

y -intercept $= -9$

x -intercept $= -12$

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2. Write each linear equation in slope-intercept form, and state its slope and y-intercept.

Hint: Solve for y . Keep y positive.

Shortcut: $y = -\frac{A}{B}x - \frac{C}{B}$, $m = -\frac{A}{B}$ and $b = -\frac{C}{B}$

(a) $4x - 5y - 8 = 0$ $y = mx + b$

$$\begin{array}{r} +5y \quad +5y \\ 4x - 8 = 5y \\ \hline \frac{4x - 8}{5} = y \end{array}$$

$m = \frac{4}{5}$
 $b = -\frac{8}{5}$

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

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

(b) $x - 3y + 9 = 0$

$$\begin{array}{r} +3y \quad +3y \\ x + 9 = 3y \\ \hline \frac{x + 9}{3} = y \end{array}$$

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

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

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

(c) $9x - 6y + 6 = 0$

$$\begin{array}{r} +3y \quad +3y \\ 9x + 6 = 3y \\ \hline 9x + 6 = 3y \end{array}$$

(d) $4x - 2y - 1 = 0$

(e) $3x + y = 0$

(f) $6x + 3y = 12$

Answers: 1. (a) $3x - y - 6 = 0$, 2, -6, (b) $x - 2y + 6 = 0$, -6, 3, (c) $6x + y - 12 = 0$, 2, 12, (d) $3x + 4y + 36 = 0$, -12, -9
2. (a) $y = \frac{4}{5}x - \frac{8}{5}$, (b) $y = \frac{1}{3}x + 3$, (c) $y = 3x + 2$, (d) $y = 2x - \frac{1}{2}$, (e) $y = -3x$, (f) $y = -2x + 4$;