

Linear Functions and Rate of Change

Linear equations

$$4x - 5y = 16$$

$$x = 10$$

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

$$y = \frac{1}{2}x$$

Nonlinear equations

$$2x + 6y^2 = -25$$

$$y = \sqrt{x} + 2$$

$$x + xy = -\frac{5}{8}$$

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

A **linear function** is a function with ordered pairs that satisfy a linear equation. Any linear function can be written in the form $f(x) = mx + b$, where m and b are real numbers.

State whether each function is a linear function. Write yes or no. Explain your answer.

$$f(x) = 8 - \frac{3}{4}x$$

$$f(x) = \frac{2}{x}$$

$$g(x, y) = 3xy - 4$$

Rules for Standard Form: $Ax + By = C$

1. "A" cannot be negative
2. A, B, C must be integers

Write each equation in standard form. Identify A, B, C.

$$-\frac{3}{10}x = 8y - 15$$

$$\underline{-8y} \quad \underline{-9y}$$

$$-10\left(-\frac{3}{10}x - 8y = -15\right)$$

$$\boxed{3x + 80y = 150}$$

$$2y = 4x + 5$$

$$\underline{-4x} \quad \underline{-4x}$$

$$-1(-4x + 2y = 5)$$

$$\boxed{4x - 2y = -5}$$

Find the x- and y-intercept for each.

$$2x - 3y + 8 = 0$$

$$2x - \cancel{3(0)} + 8 = 0$$

$$2x + 8 = 0$$

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

$$x = -4$$

$$2(0) - 3y + 8 = 0$$

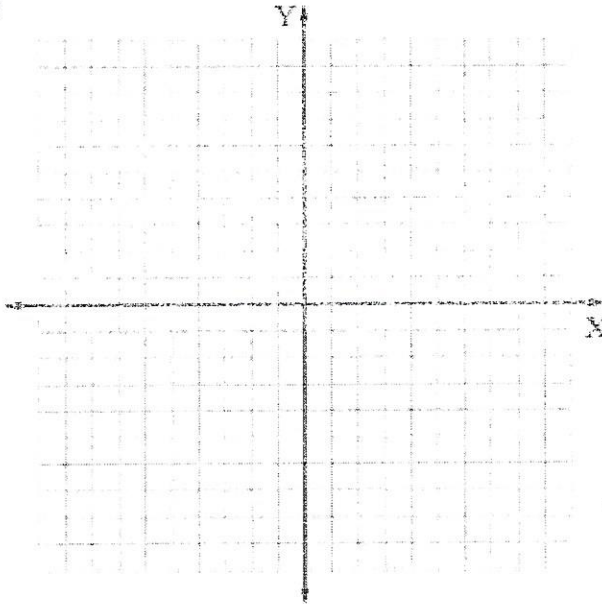
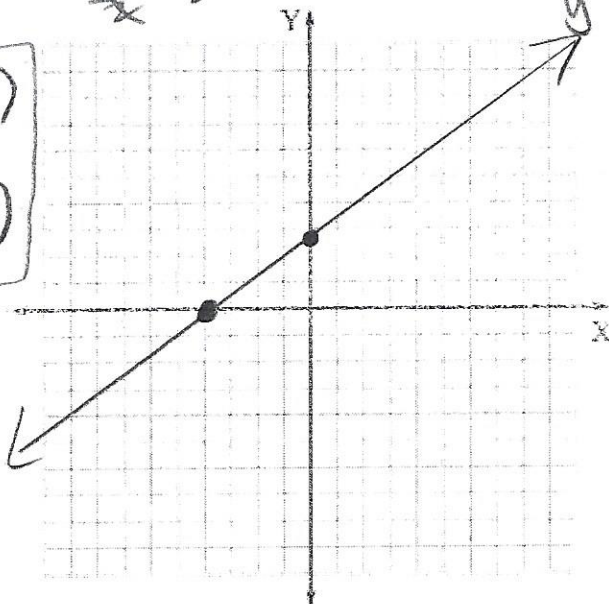
$$-3y + 8 = 0$$

$$-3y = -8$$

$$y = \frac{8}{3}$$

$$2x + 5y - 10 = 0$$

$(-4, 0)$
 $(0, \frac{8}{3})$



Rate of change: (slope) m

$\frac{\text{change in } y}{\text{change in } x}$

OR $\frac{y_2 - y_1}{x_2 - x_1}$ OR $\frac{y_1 - y_2}{x_1 - x_2}$

Time (min)	Temperature ($^{\circ}\text{C}$)
0	143.6
2	139.4
5	133.1
8	126.8
12	118.4

CHEMISTRY The table shows the temperature of a solution after it has been removed from a heat source. Find the rate of change in temperature for the solution.

$$\frac{139.4 - 143.6}{2 - 0} = \frac{-4.2}{2} = -2.1$$

$-2.1^{\circ}/\text{min}$

Find the slope.

$(-4, 3), (2, 5)$

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

Now find the missing coordinate.

$(5, 8), (11, y); m = \frac{5}{3}$

$$\frac{y-8}{11-5} = \frac{5}{3}$$

$$\cancel{\frac{y-8}{11-5}} = \cancel{\frac{5}{3}} \cancel{1}^2$$

$$\begin{array}{r} y-8 = 10 \\ \cancel{+8} \quad \cancel{+8} \end{array} \quad y = 18$$

Homework: p72 16-32 even, 35-39; p79 1-3, 10, 11, 22, 31-34

$$\cancel{\frac{5}{1}} \cancel{\frac{y-8}{1}} = \frac{3}{5} \cdot \frac{5}{1} \cdot \frac{y-8}{1}$$

$$30 = 3y - 24$$