

Algebra 2 2.2

Identify linear relations and functions

Write linear equations in standard form

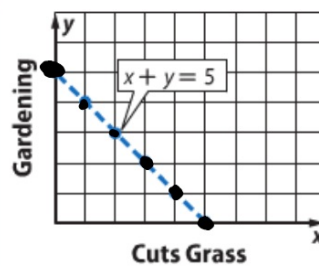
linear	<i>graph → line</i>
nonlinear	<i>not a line</i>
linear equation	$2x + 3 = 0$
linear function	$f(x) = 2x + 3$
y-intercept	$y = 2x + 3$
x-intercept	
standard form	

Alg 1 Ch. 3 & 4

Why?

- Laura does yard work to earn money during the summer. She either cuts grass x or does general gardening y , and she schedules 5 jobs per day. The equation $x + y = 5$ can be used to relate how many of each task Laura can do in a day.

Yard Work



$$y = -x + 5$$

Linear equations

$$4x - 5y = 16$$

$$x = 10$$

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

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

$$y = \sqrt{3}x$$

Nonlinear equations

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

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

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

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

How can we tell?

expon.
product
var in denoms

Example 1 Identify Linear Functions

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

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

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

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

Guided Practice

1A. $f(x) = \frac{5}{x+6}$

1B. $g(x) = -\frac{3}{2}x + \frac{1}{3}$

Real-World Example 2 Evaluate a Linear Function



PLANTS The growth rate of a sample of Bermuda grass is given by the function $f(x) = 5.9x + 3.25$, where $f(x)$ is the total height in inches x days after an initial measurement.

- a. How tall is the sample after 3 days?

$$f(3) = 20.95 \text{ in}$$

$$y = f(x) = 5.9x + 3.25$$

- b. The term 3.25 in the function represents the height of the grass when it was initially measured. The sample is how many times as tall after 3 days?

$$(3.25)? = 20.95$$

approx 6.4



Real-WorldLink

The largest member of the grass family, bamboo, is capable of growing from 1 to 4 feet per day.

Source: Infoplease

$$Ax + By = C$$

2 Standard Form Any linear equation can be written in **standard form**, $Ax + By = C$, where A , B , and C are integers with a greatest common factor of 1.

Key Concept Standard Form of a Linear Equation

Words The standard form of a linear equation is $Ax + By = C$, where A , B , and C are integers with a greatest common factor of 1, $A \geq 0$, and A and B are not both zero.

Example $3x + 5y = 12$; $A = 3$, $B = 5$, and $C = 12$

$$A=3 \quad B=5 \quad C=12$$

in order
integers
GCF/A is positive $\div$ GCF
(we want there to only be one version)

$$Ax + By = C$$

► **Guided** Practice

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

3A. $2y = 4x + 5$

$$\begin{array}{r} -4x \quad -4x \\ \hline \end{array}$$

$$\frac{-4x}{-1} + \frac{2y}{-1} = \frac{5}{-1}$$

∴ $4x - 2y = -5$

3B. $3x - 6y - 9 = 0$

$$\begin{array}{r} +9 \quad +9 \\ \hline \end{array}$$

$$\frac{3x}{3} - \frac{6y}{3} = \frac{9}{3}$$

$$x - 2y = 3$$

Example 3 Standard Formintegers
in order
(GCF)Write $-\frac{3}{10}x = 8y - 15$ in standard form. Identify A , B , and C .

$$\begin{array}{r} -8y \quad -8y \\ -10 \cdot \quad -10 \cdot \quad -10 \cdot \\ -10 \cdot \left(-\frac{3}{10}x\right) + 8y = -15 \\ 3x + 8y = 150 \end{array}$$

$$\begin{array}{l} A = 3 \\ \uparrow \\ \text{pos} \end{array} \quad B = 80 \quad C = 150$$

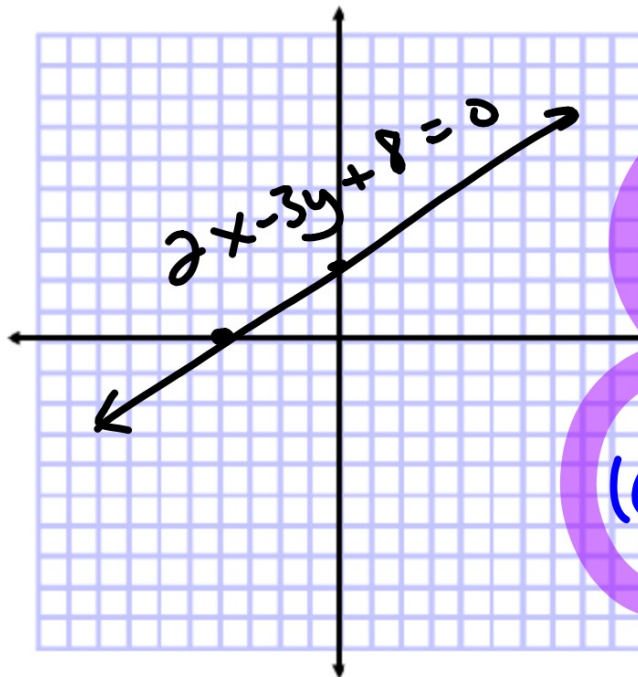
cross x-axis? cross y-axis?



Example 4 Use Intercepts to Graph a Line

Find the x-intercept and the y-intercept of the graph of $2x - 3y + 8 = 0$. Then graph the equation.

TOV or x-int & y-int



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

x-int
 $(-4, 0)$

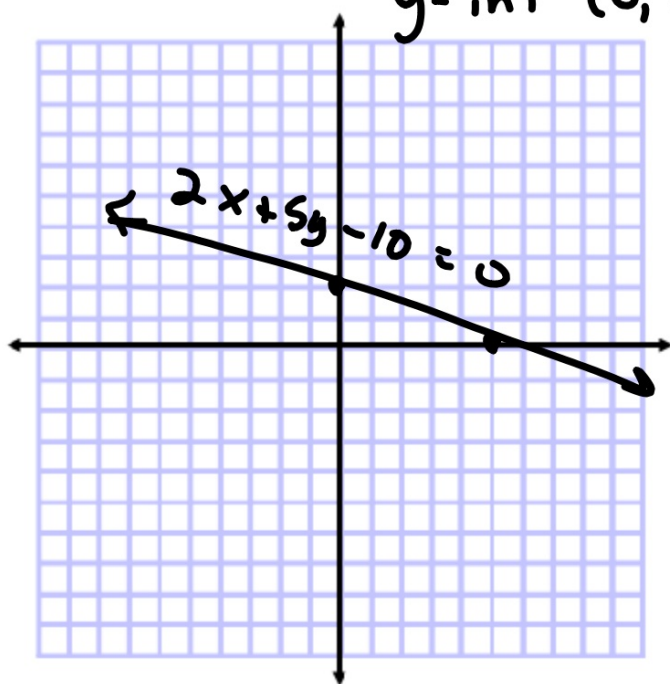
$$\begin{aligned} 2x - 0 + 8 &= 0 \\ 2x &= -8 \\ x &= -4 \end{aligned}$$

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

$$\begin{aligned} 2x - 3y + 8 &= 0 \\ 0 - 3y + 8 &= 0 \\ -3y &= -8 \\ y &= \frac{8}{3} \end{aligned}$$

Guided Practice

4. Find the x -intercept and the y -intercept of the graph of $2x + 5y - 10 = 0$. Then graph the equation.



x -int $(5, 0)$
 y -int $(0, 2)$

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

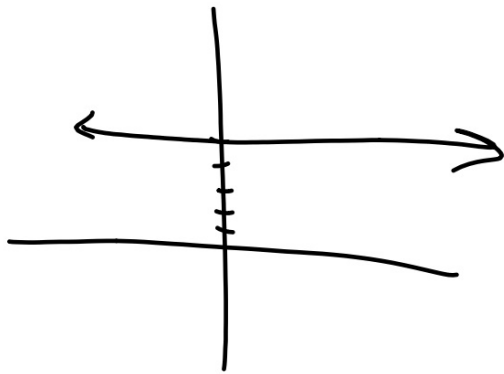
$$2x + 5y - 10 = 0$$
$$2x + 0 - 10 = 0$$
$$+10 \quad +10$$

$$\frac{2x}{2} = \frac{10}{2} \quad x = 5$$

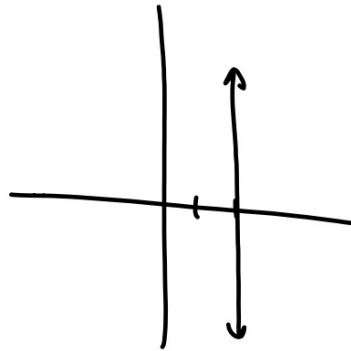
$$0 + 5y - 10 = 0$$
$$\frac{5y}{5} = \frac{10}{5}$$
$$y = 2$$

x int $(5, 0)$

$$y = 5$$



$$x = 2$$



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