

Lesson 2-1

**Example 1**

Solve the system of equations by graphing.

$$2x + 5y = 9$$

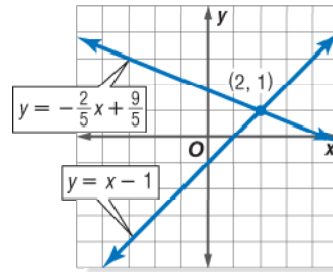
$$x - y = 1$$

First rewrite each equation of the system in slope-intercept form by solving for  $y$ .

$$2x + 5y = 9 \quad \rightarrow \quad y = -\frac{2}{5}x + \frac{9}{5}$$

$$x - y = 1 \quad \rightarrow \quad y = x - 1$$

Since the two lines have different slopes, the graphs of the equations are intersecting lines. The solution to the system is  $(2, 1)$ .



**Example 2**

Use the elimination method to solve the system of equations.

$$3x - 2y = 18$$

$$4x + 3y = -10$$

One way to solve this system is to multiply both sides of the first equation by 3, multiply both sides of the second equation by 2, and add the two equations to eliminate  $y$ . Then solve the resulting equation.

$$\begin{array}{rcl} 3(3x - 2y) = 3(18) & \rightarrow & 9x - 6y = 54 \\ 2(4x + 3y) = 2(-10) & \rightarrow & 8x + 6y = -20 \\ \hline 17x & = & 34 \\ x & = & 2 \end{array}$$

Now substitute 2 for  $x$  in either of the *original* equations.

$$\begin{array}{rcl} 3x - 2y = 18 & & \\ 3(2) - 2y = 18 & x = 2 & \\ -2y = 12 & & \\ y = -6 & & \end{array}$$

The solution is  $(2, -6)$ . *Check it by substituting into  $4x + 3y = -10$ . If the coordinates make both equations true, then the solution is correct.*

**Example 3**

Use the substitution method to solve the system of equations.

$$4x - 3y = 11$$

$$x + y = 8$$

You can solve the second equation for either  $y$  or  $x$ . If you solve for  $x$ , the result is  $x = 8 - y$ . Then substitute  $8 - y$  for  $x$  in the first equation.

$$\begin{aligned} 4x - 3y &= 11 \\ 4(8 - y) - 3y &= 11 & x = 8 - y \\ -7y &= -21 \\ y &= 3 \end{aligned}$$

Now substitute 3 for  $y$  in either of the original equations, and solve for  $x$ .

$$\begin{aligned} x + y &= 8 \\ x + 3 &= 8 & y = 3 \\ x &= 5 \end{aligned}$$

The solution is  $(5, 3)$ .

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**Example 4**

**CONSUMER CHOICES** Jeremy is considering two different cell phone plans. The first plan has a \$25 monthly fee plus \$0.25 per minute used. The second plan offers a \$10 monthly fee with a \$0.40 charge per minute used.

- What is the break-even point in the two cell phone plans that Jeremy is considering?
- If Jeremy expects to use the phone for no more than 75 minutes each month, which plan should he choose?

- First, write an equation to represent the amount he will pay with each plan. Let  $C$  represent the total monthly cost and  $m$  represent the number of minutes used.

Plan 1 (\$25 monthly charge plus \$0.25 per minute):  $C = 0.25m + 25$

Plan 2 (\$10 monthly charge plus \$0.40 per minute):  $C = 0.40m + 10$

Now, solve the system of equations. Since both equations contain  $C$ , we can substitute the value of  $C$  from one equation into the other.

$$\begin{aligned} C &= 0.25m + 25 \\ 0.40m + 10 &= 0.25m + 25 & C = 0.40m + 10 \\ 0.15m &= 15 \\ m &= 100 \end{aligned}$$

The break-even point occurs at a monthly usage of 100 minutes.

- The graph of the equations shows that for monthly usage under 100 minutes, Plan 2 is less expensive. So, Jeremy should probably choose Plan 2.

