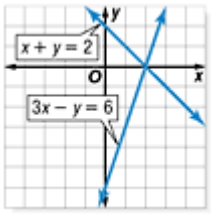
**Lesson 3–1**

## Example 1 Solve by Graphing

**Solve the system of equations by graphing.**

$x + y = 2$

$3x - y = 6$




Write each equation in slope–intercept form.

$x + y = 2 \quad \rightarrow \quad y = -x + 2$

$3x - y = 6 \quad \rightarrow \quad y = 3x - 6$

The graphs appear to intersect at (2, 0).

**Check** Substitute the coordinates into each equation.

| $x + y = 2$ | $3x - y = 6$ | Original equations |
|---|---|---|
| $2 + 0 \stackrel{?}{=} 2$ | $3(2) - 0 \stackrel{?}{=} 6$ | Replace $x$ with 2 and $y$ with 0. |
| $2 = 2$ ✓ | $6 - 0 \stackrel{?}{=} 6$ | Simplify. |
| | $6 = 6$ ✓ | |

The solution of the system is (2, 0).

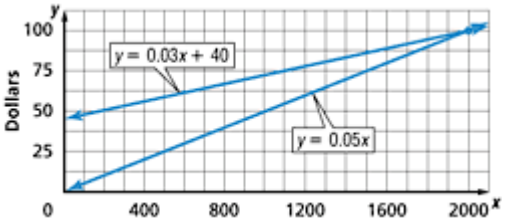
## Example 2 Break–Even Point Analysis

**BUSINESS Laura's Copies has two options for buying photocopies. With Option 1, you can buy a card for $40 each year and then pay $0.03 per copy. With Option 2, you can just pay $0.05 per copy. For how many copies would the cost of Options 1 and 2 be the same? What is the cost?**

Let $x$ = the number of copies, and let $y$ = the cost of the copies.

| Cost of $x$ copies using Option 1 | is | cost per copy | plus | cost of card. |
|---|---|---|---|---|
| $y$ | = | $0.03x$ | + | 40 |

| Cost of $x$ copies using Option 2 | is | cost per copy |
|---|---|---|
| $y$ | = | $0.05x$ |




The graphs intersect at (2000, 100). This is the break–even point. The cost of making copies is the same if you make 2000 copies. The cost is $100.

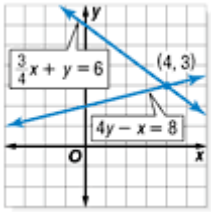
If a person plans to make less than 2000 copies during the year, he or she should use Option 2. If a person plan to make more than 2000 copies during the year, he or she should use Option 1.

## Example 3 Intersecting Lines

**Graph the system of equations and describe it as *consistent and independent, consistent and dependent,* or *inconsistent*.**

**$4y - x = 8$**

**$\frac{3}{4}x + y = 6$**




Write each equation in slope-intercept form.

$4y - x = 8 \quad \rightarrow \quad y = \frac{1}{4}x + 2$

$\frac{3}{4}x + y = 6 \quad \rightarrow \quad y = -\frac{3}{4}x + 6$

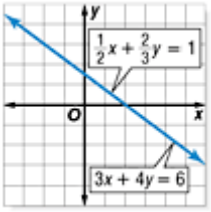
The graphs intersect at (4, 3). Since there is one solution, the system is *consistent* and *independent*.

## Example 4 Same Line

**Graph the system of equations and describe it as *consistent and independent, consistent and dependent,* or *inconsistent*.**

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

**$3x + 4y = 6$**




$\frac{1}{2}x + \frac{2}{3}y = 1 \quad \rightarrow \quad y = -\frac{3}{4}x + \frac{3}{2}$

$3x + 4y = 6 \quad \rightarrow \quad y = -\frac{3}{4}x + \frac{3}{2}$

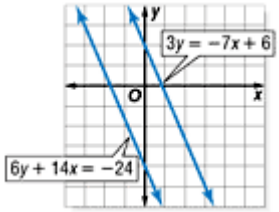
Since the equations are equivalent, their graphs are the same line. Any ordered pair representing a point on that line will satisfy both equations. So, there are infinitely many solutions to this system. This system is *consistent* and *dependent*.

## Example 5 Parallel Lines

**Graph the system of equations and describe it as *consistent and independent, consistent and dependent,* or *inconsistent*.**

**$3y = -7x + 6$**

**$6y + 14x = -24$**




$3y = -7x + 6 \quad \rightarrow \quad y = -\frac{7}{3}x + 2$

$6y + 14x = -24 \quad \rightarrow \quad y = -\frac{7}{3}x - 4$

The lines do not intersect. Their graphs are parallel lines. So, there are no solutions that satisfy both equations. This system is *inconsistent*.