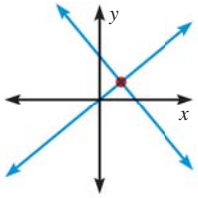
CLASSIFYING SYSTEMS A system that has at least one solution is **consistent**. If a system has no solution, the system is **inconsistent**. A consistent system that has exactly one solution is **independent**, and a consistent system that has infinitely many solutions is **dependent**. The system in Example 1 is consistent and independent.

KEY CONCEPT *For Your Notebook*

Number of Solutions of a Linear System

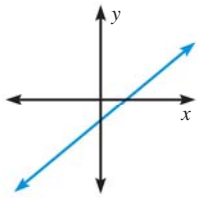
The relationship between the graph of a linear system and the system's number of solutions is described below.

Exactly one solution



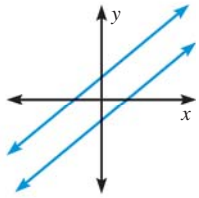
Lines intersect at one point; consistent and independent

Infinitely many solutions



Lines coincide; consistent and dependent

No solution



Lines are parallel; inconsistent

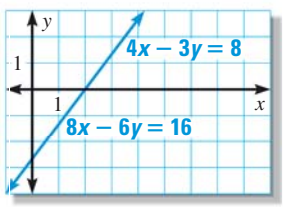
EXAMPLE 2 Solve a system with many solutions

Solve the system. Then classify the system as *consistent and independent*, *consistent and dependent*, or *inconsistent*.

$$4x - 3y = 8 \quad \text{Equation 1}$$
$$8x - 6y = 16 \quad \text{Equation 2}$$

Solution

The graphs of the equations are the same line. So, each point on the line is a solution, and the system has infinitely many solutions. Therefore, the system is consistent and dependent.



CHECK SOLUTION

To check your solution in Example 2, observe that both equations have the same slope-intercept form:

$$y = \frac{4}{3}x - \frac{8}{3}$$

So the graphs are the same line.

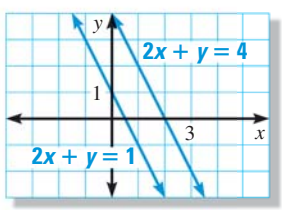
EXAMPLE 3 Solve a system with no solution

Solve the system. Then classify the system as *consistent and independent*, *consistent and dependent*, or *inconsistent*.

$$2x + y = 4 \quad \text{Equation 1}$$
$$2x + y = 1 \quad \text{Equation 2}$$

Solution

The graphs of the equations are two parallel lines. Because the two lines have no point of intersection, the system has no solution. Therefore, the system is inconsistent.



CHECK SOLUTION

To verify that the graphs in Example 3 are parallel lines, write the equations in slope-intercept form and observe that the lines have the same slope, −2, but different *y*-intercepts, 4 and 1.