Name _____ Date _____

Solving Systems of Equations

A **system of linear equations** is a set of two or more linear equations in the same variables. An example is shown at the right. A **solution of a system of linear equations** in two variables is an ordered pair that is a solution of each equation in the system.

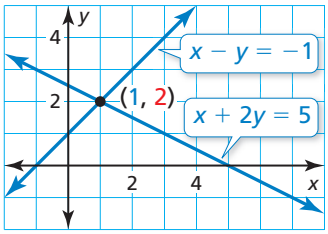
$x + 2y = 5$ Equation 1
$x - y = -1$ Equation 2

Example 1 **Solve the system of linear equations above by (a) graphing, (b) substitution, and (c) elimination.**

a. Graph each equation. The graphs appear to intersect at (1, 2). Check this point.

Equation 1 $x + 2y = 5$
$1 + 2(2) \stackrel{?}{=} 5$
$5 = 5$ ✓

Equation 2 $x - y = -1$
$1 - 2 \stackrel{?}{=} -1$
$-1 = -1$ ✓



▶ The solution is (1, 2).

b. Solve for x in Equation 2. $x - y = -1$
$x = y - 1$

Substitute $y - 1$ for x in Equation 1 and solve for y. $x + 2y = 5$
$(y - 1) + 2y = 5$
$y = 2$

Substitute 2 for y in Equation 2 and solve for x. $x - y = -1$
$x - 2 = -1$
$x = 1$

▶ The solution is (1, 2).

c. Multiply Equation 2 by 2. Then add the equations and solve the resulting equation.

$x + 2y = 5 \Rightarrow x + 2y = 5$
$x - y = -1 \Rightarrow 2x - 2y = -2$
$3x = 3$
$x = 1$

Substitute 1 for x in Equation 2 and solve for y. $x - y = -1$
$1 - y = -1$
$2 = y$

▶ The solution is (1, 2).

Practice

Check your answers at BigIdeasMath.com.

Solve the system of linear equations by graphing.

1. $y = x - 3$
$y = -x + 1$ $(2, -1)$

2. $-x + 2y = -1$
$x + y = 4$ $(3, 1)$

3. $2x + y = 5$
$4x - 2y = 6$ $(2, 1)$

4. $9x - 3y = 3$
$3x + y = 1$
$\left(\frac{1}{3}, 0\right)$

Solve the system of linear equations by substitution.

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

6. $x = y + 3$
$5x - y = 7$ $(1, -2)$

7. $3x - y = 5$
$2x - y = -3$ $(8, 19)$

8. $x - 2y = -3$
$7x - 2y = 15$ $(3, 3)$

Solve the system of linear equations by elimination.

9. $-2x + 2y = -2$
$2x + y = 5$ $(2, 1)$

10. $x - 4y = -3$
$4x + y = 5$ $(1, 1)$

11. $x + 5y = -2$
$5x + y = 14$ $(3, -1)$

12. $2x + 3y = 5$
$4x + 6y = -10$
no solution