

Study Guide

Substitution

One method of solving systems of equations is by algebraic **substitution**.

Example: Solve $x + 3y = 7$ and $2x - 4y = 6$.

Solve the first equation for x .

$$\begin{aligned}x + 3y &= 7 \\x &= 7 - 3y\end{aligned}$$

Substitute $7 - 3y$ for x in the second equation. Solve for y .

$$\begin{aligned}2(7 - 3y) - 4y &= -6 \\14 - 6y - 4y &= -6 \\-10y &= -20 \\y &= 2\end{aligned}$$

Substitute 2 for y in either one of the two original equations to find the value of x .

$$\begin{aligned}x + 3(2) &= 7 \\x + 6 &= 7 \\x &= 1\end{aligned}$$

The solution of this system is $(1, 2)$.

Use substitution to solve each system of equations. If the system does not have exactly one solution, state whether it has no solution or infinitely many solutions.

1. $x = 3$
 $2y + x = 3$

2. $y = 2$
 $2x - 4y = 1$

3. $y = 3x - 7$
 $3x - y = 7$

4. $y = -x + 3$
 $2y + 2x = 4$

5. $x + y = 16$
 $2y = -2x + 2$

6. $x = 2y$
 $0.25x + 0.5y = 10$

Use a system of equations and substitution to solve each problem.

7. How much of a 10% saline solution should be mixed with a 20% saline solution to obtain 1000 milliliters of a 12% saline solution?

8. The tens digit of a two-digit number is 3 greater than the units digit. Eight times the sum of the digits is 1 less than the number. Find the number.