

Solving Systems of Equations by Substitution

To be able to solve systems using substitutions we need to be able to **isolate one of the variables on one side of the equation**. So, let's quickly review this.

Solve each equation for the indicated variable.

$$2x - y = 9, y$$

$$2x = 9 + y$$

$$2x - 9 = y$$

$$7x - y = 3, x$$

$$7x = 3 + y$$

$$x = \frac{3 + y}{7}$$

$$x + 2y = 8, y$$

$$3x + 5y = 18, x$$

To solve a system of equations using substitution we need to solve one of the equations for a variable and then substitute into the second equation. Let's try it in this example.

$$\begin{array}{l} \textcircled{1} \quad 2x + y = 4 \\ \textcircled{2} \quad 3x + 2y = 3 \end{array} \quad \rightarrow \quad y = \boxed{4 - 2x}$$

$$3x + 2 \cdot (4 - 2x) = 3$$

$$3x + 8 - 4x = 3$$

$$-1x + 8 = 3$$

$$-1x = -5$$

$$\boxed{x = 5}$$

$$y = 4 - 2x$$

$$y = 4 - 2(5)$$

$$\boxed{y = -6}$$

$$\underline{\underline{(5, -6)}}$$

Let's try another one!!!!

$$2x + 6y = 3$$

$$x - 4y = 5$$

$$x = 4y + 5$$

$$2(4y + 5) + 6y = 3$$

$$8y + 10 + 6y = 3$$

$$\frac{14y}{14} = \frac{-7}{14}$$

$$y = -\frac{1}{2}$$

$$x = 5 + 4y$$

$$x = 5 + 4(-0.5)$$

$$x = 5 + -2$$

$$x = 3$$

$$(3, -\frac{1}{2})$$

We need to know the method of substitution because not ALL systems of equations can be solved using the method of addition and subtraction.

For example,

Solve

$$y = 9 - x^2 \text{ and } y = x + 3$$

$$9 - x^2 = x + 3$$

$$0 = x^2 + x - 6$$

$$\begin{array}{r} 3 \\ \hline -2 \\ +1 \end{array} x - 6$$

$$(x+3)(x-2) = 0$$

$$x+3=0$$

$$x = -3$$

$$x-2=0$$

$$x = 2$$

$$x = -3$$

$$y = x + 3$$

$$y = -3 + 3$$

$$y = 0$$

$$(-3, 0)$$

$$x = 2$$

$$y = x + 3$$

$$y = 2 + 3$$

$$y = 5$$

$$(2, 5)$$

Assignment:

Pg. 325 1, 4, 6, 9 and 16


odds