Remediation Unit 6 Objective 3
Solving a System of Equations using Substitution Method

Steps for Substitution

1. Solve one of the equations for one of its variables → need to have either $x =$ or $y =$
2. Substitute the expression from step 1 into the OTHER equation and solve for the other variable.
3. Substitute the value from step 2 into the one of the original equations and find the value of the second variable.

Example

Solve the following system using substation: $\begin{cases} 2x - y = 6 \\ 2x + 2y = -9 \end{cases}$

Step 1: Solve one of the equations for one of its variable. Look for the variable that has a coefficient of 1 (no number written in front). We will be solving the first equation for *y*.

Equation 1: $2x - y = 6$ → solve for y

$-2x \quad -2x$

$-y = -2x + 6$ → Divide by -1 to get y all by itself

$-1 \quad -1 \quad -1$

$y = 2x - 6$ → y is by itself so we are ready for Step 2

Step 2: Take the equation from Step 1 ($y = 2x - 6$) and substitute $2x - 6$ wherever you see *y* written in the OTHER equation

Equation 2: $2x + 2y = -9$ ← Write $2x - 6$ instead of *y*

$2x + 2(2x - 6) = -9$ ← Distribute

$2x + 4x - 12 = -9$ ← Solve for x

$6x - 12 = -9$

$+12 \quad +12$

$\frac{6x}{6} = \frac{3}{6}$

$x = \frac{1}{2}$

Step 3: Substitute $\frac{1}{2}$ in for x and solve for y. It does not matter which equation you use, but it will be easier to use the equation from step 1 since we already have y =

$y = 2x - 6 \rightarrow y = 2\left(\frac{1}{2}\right) - 6 \rightarrow y = 1 - 6 \rightarrow y = -5$

Solution: $\left(\frac{1}{2}, -5\right)$

Practice

Solve each system using the substitution method.

1.) $\begin{cases} x - 3y = -1 \\ y = -4x + 22 \end{cases}$

2.) $\begin{cases} -3x - 4y = 12 \\ y = -2x - 3 \end{cases}$

3.) $\begin{cases} -3x - 4y = 0 \\ x = -2y + 2 \end{cases}$

4.) $\begin{cases} 2x + y = -2 \\ 5x - 2y = 4 \end{cases}$

5.) $\begin{cases} y = -4x - 1 \\ y = 8x + 11 \end{cases}$

6.) $\begin{cases} 3x + 2y = 10 \\ x = y \end{cases}$

7.) $\begin{cases} x = -4y + 4 \\ x = 2y + 10 \end{cases}$

8.) $\begin{cases} 12x + 3y = 6 \\ y = -4x + 19 \end{cases}$