



Solving Systems of Equations by Substitution (Part 2)

(Video Notes)

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Solving Systems of Equations by Substitution (Part 2)

Solve the following system of equations by substitution.

$$4x - 3y = 26$$

$$x + 5y = -5$$

1. Isolate a variable.

↓ get alone → any variable in any equation

$$\begin{array}{r} x + 5y = -5 \\ -5y \quad -5y \\ \hline x = -5 - 5y \end{array}$$

2. Substitute the new equivalent expression into the other equation in the system.

$$x = (-5 - 5y)$$

$$\hookrightarrow 4x - 3y = 26$$

↓ sub

$$4(-5 - 5y) - 3y = 26$$

3. Now that I have a unique variable, I can solve!

$$4(-5 - 5y) - 3y = 26$$

$$-20 - 20y - 3y = 26$$

$$\begin{array}{r} -20 - 23y = 26 \\ +20 \quad +20 \\ \hline \end{array}$$

$$-23y = 46$$

$$\begin{array}{r} -23y = 46 \\ -23 \quad -23 \\ \hline \end{array}$$

$$y = -2$$

4. Solve for the missing variable.

$$\begin{array}{r} x + 5y = -5 \\ \downarrow \\ x + 5(-2) = -5 \\ x - 10 = -5 \\ \quad +10 \quad +10 \\ \hline x = 5 \end{array}$$

Solution:
(5, -2)

Solve the following system of equations by substitution.

$$3y + 5x = -41$$

$$12x - 6y = -6$$

1. Isolate a variable.

$$\begin{array}{r} +12x - 6y = -6 \\ -12x \quad \downarrow \quad -12x \\ \hline -6y = -6 - 12x \\ \frac{-6y}{-6} = \frac{-6}{-6} - \frac{12x}{-6} \\ y = 1 + 2x \end{array}$$

2. Substitute the new equivalent expression into the other equation in the system.

$$y = (1 + 2x)$$

$$\begin{array}{l} \hookrightarrow 3y + 5x = -41 \\ \downarrow \text{sub} \end{array}$$

$$\underline{3(1 + 2x) + 5x = -41}$$

3. Now that I have a unique variable, I can solve!

$$\begin{array}{r} \curvearrowright \\ 3(1 + 2x) + 5x = -41 \\ 3 + \underline{6x} + \underline{5x} = -41 \\ \cancel{3} + 11x = -41. \\ \hline \cancel{-3} \quad \quad \quad -3. \\ 11x = -44 \\ \frac{11x}{11} = \frac{-44}{11} \\ \underline{x = -4} \end{array}$$

4. Solve for the missing variable.

$$y = ?$$

$$3y + 5x = -41$$

$$3y + 5(-4) = -41$$

$$\begin{array}{r} 3y - 20 = -41 \\ +20 \quad +20 \\ \hline \end{array}$$

$$\frac{3y}{3} = \frac{-21}{3}$$

$$y = -7$$

Solution:
 $(-4, -7)$