

Section 6.2  
Solving Systems  
Using Substitution

Goal: to solve for two unknowns in a system by substituting one variable expression into the other equation.

Graphing sometimes give approximate solutions to a system, so we will use substitution as one method for getting an exact solution.

Using substitution, you will solve for one variable and substitute into the other equation.

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Solve:

$$\begin{cases} y = 2x + 7 \\ y = x - 1 \end{cases}$$

$$x - 1 = 2x + 7$$

$$-x = 8$$

$$x = -8$$

$$y = 2(-8) + 7 = -16 + 7 = -9$$

$$y = -8 - 1 = -9$$

$(-8, -9)$

Sometimes, you have to solve one of the equations for a variable to substitute it into the other equation.

Always look for a variable to solve for that will not create fractions.

Example:

$$\begin{cases} 2x + 3y = 40 \\ 8x - y = 4 \end{cases}$$

$y = -4 + 8x$

$$2x + 3(-4 + 8x) = 40$$

$$2x - 12 + 24x = 40$$

$$26x = 52$$

$$x = 2$$

$y = -4 + 8(2) = 12$

$(2, 12)$

Solve for y to not have fractions

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Solve using substitution:

$$\begin{cases} 6y + 5x = 1 \\ x + 3y = -7 \end{cases}$$

$$x = -7 - 3y$$

$$6y + 5(-7 - 3y) = 1$$

$$6y - 35 - 15y = 1$$

$$-9y = 36$$

$$y = -4$$

$$x = -7 - 3(-4) = -7 + 12 = 5$$

$(5, -4)$

Solve using substitution:

$$\begin{cases} x - 2y - 1 = 0 \\ y - 5x + 14 = 0 \end{cases}$$

$$x = 2y + 1$$

$$y - 5(2y + 1) + 14 = 0$$

$$y - 10y - 5 + 14 = 0$$

$$-9y = -9$$

$$y = 1$$

$$x = 2(1) + 1 = 3$$

$(3, 1)$

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Solve using substitution:

$$12y - 36 = -6x$$

$$\frac{2x + 4y}{7} = \frac{12 - 4y}{2}$$

$$x = 6 - 2y$$

$$12y - 36 = -6(6 - 2y)$$

$$12y - 36 = -36 + 12y$$

$$-12y + 36 + 36 - 12y$$

$$0 = 0$$

inf many

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Remember the special situations, no solution and infinitely many solutions (identity).

if you get  $0 = 0$ , it is identity

if you get  $0 = 7$  (for example), it is no solution

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A shopper bought 8 shirts and 5 pairs of pants for \$220. The next day, he purchased 5 shirts and 1 pair of pants for \$112. How much does each shirt and each pair of pants cost?

$$\begin{cases} 8x + 5y = 220 \\ 5x + 1y = 112 \end{cases}$$

↑  
solve for y

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Hwk: pg. 375 - 377  
#12 - 20 (4th), 24 - 30 evens,  
34, 40, 44, 45,

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