

Review Exercise Set 21

Exercise 1: Determine the solution of the following system of equations by using the substitution method.

$$5x + 2y = -9$$

$$4x - 3y = 2$$

Exercise 2: Determine the solution of the following system of equations by using the substitution method.

$$x + y = 20$$

$$x = y - 4$$

Exercise 3: Determine the solution of the following system of equations by using the substitution method.

$$2x - 3y = -16$$

$$6x - 7y = 16$$

Exercise 4: Determine the solution of the following system of equations by using the substitution method.

$$6x + 7y = 17$$

$$3x + y = -4$$

Exercise 5: Determine the solution of the following system of equations by using the substitution method.

$$4x + 7y = 2$$

$$9x - 2y = 1$$

Review Exercise Set 21 Answer Key

Exercise 1: Determine the solution of the following system of equations by using the substitution method.

$$5x + 2y = -9$$

$$4x - 3y = 2$$

Solve the first equation for one of the variables

$$5x + 2y = -9$$

$$2y = -5x - 9$$

$$y = -\frac{5}{2}x - \frac{9}{2}$$

Substitute the expression for y into the second equation and solve for x

$$4x - 3y = 2$$

$$4x - 3\left(-\frac{5}{2}x - \frac{9}{2}\right) = 2$$

$$4x + \frac{15}{2}x + \frac{27}{2} = 2$$

$$2\left(4x + \frac{15}{2}x + \frac{27}{2}\right) = 2(2) \quad 4x - 3y = 2$$

$$8x + 15x + 27 = 4$$

$$23x = 4 - 27$$

$$23x = -23$$

$$x = -1$$

Now substitute the value for x into the first equation to find y

$$5x + 2y = -9$$

$$5(-1) + 2y = -9$$

$$-5 + 2y = -9$$

$$2y = -9 + 5$$

$$2y = -4$$

$$y = -2$$

The solution for the system of equations is (-1, -2).

Exercise 2: Determine the solution of the following system of equations by using the substitution method.

$$\begin{aligned}x + y &= 20 \\x &= y - 4\end{aligned}$$

Since the second equation is already solved for x , substitution it into the first equation and solve for y

$$\begin{aligned}x + y &= 20 \\(y - 4) + y &= 20 \\2y - 4 &= 20 \\2y &= 20 + 4 \\2y &= 24 \\y &= 12\end{aligned}$$

Substitute the value of y into the second equation to find x

$$\begin{aligned}x &= y - 4 \\x &= 12 - 4 \\x &= 8\end{aligned}$$

The solution for the system of equations is (8, 12).

Exercise 3: Determine the solution of the following system of equations by using the substitution method.

$$\begin{aligned}2x - 3y &= -16 \\6x - 7y &= 16\end{aligned}$$

Solve the first equation for one of the variables

$$\begin{aligned}2x - 3y &= -16 \\2x &= 3y - 16 \\x &= \frac{3}{2}y - 8\end{aligned}$$

Exercise 3 (Continued):

Substitute the expression for x into the second equation and solve for y

$$\begin{aligned}6x - 7y &= 16 \\6\left(\frac{3}{2}y - 8\right) - 7y &= 16 \\9y - 48 - 7y &= 16 \\2y - 48 &= 16 \\2y &= 48 + 16 \\2y &= 64 \\y &= 32\end{aligned}$$

Substitute the value of y into the first equation to find x

$$\begin{aligned}2x - 3y &= -16 \\2x - 3(32) &= -16 \\2x - 96 &= -16 \\2x &= -16 + 96 \\2x &= 80 \\x &= 40\end{aligned}$$

The solution for the system of equations is (40, 32).

Exercise 4: Determine the solution of the following system of equations by using the substitution method.

$$\begin{aligned}6x + 7y &= 17 \\3x + y &= -4\end{aligned}$$

Solve the second equation for y (since it does not have a coefficient)

$$\begin{aligned}3x + y &= -4 \\y &= -4 - 3x \\y &= -3x - 4\end{aligned}$$

Exercise 4 (Continued):

Substitute the expression for y into the first equation and solve for x

$$\begin{aligned}6x + 7y &= 17 \\6x + 7(-3x - 4) &= 17 \\6x - 21x - 28 &= 17 \\-15x - 28 &= 17 \\-15x &= 17 + 28 \\-15x &= 45 \\x &= -3\end{aligned}$$

Substitute the value of x into the second equation to find y

$$\begin{aligned}3x + y &= -4 \\3(-3) + y &= -4 \\-9 + y &= -4 \\y &= -4 + 9 \\y &= 5\end{aligned}$$

The solution for the system of equations is (-3, 5).

Exercise 5: Determine the solution of the following system of equations by using the substitution method.

$$\begin{aligned}4x + 7y &= 2 \\9x - 2y &= 1\end{aligned}$$

Solve the first equation for one of the variables

$$\begin{aligned}4x + 7y &= 2 \\7y &= -4x + 2 \\y &= -\frac{4}{7}x + \frac{2}{7}\end{aligned}$$

Exercise 5 (Continued):

Substitute the expression for y into the second equation and solve for x

$$\begin{aligned}9x - 2y &= 1 \\9x - 2\left(-\frac{4}{7}x + \frac{2}{7}\right) &= 1 \\9x + \frac{8}{7}x - \frac{4}{7} &= 1 \\7\left(9x + \frac{8}{7}x - \frac{4}{7}\right) &= 7(1) \\63x + 8x - 4 &= 7 \\71x - 4 &= 7 \\71x &= 7 + 4 \\71x &= 11 \\x &= \frac{11}{71}\end{aligned}$$

Now substitute the value for x into the first equation to find y

$$\begin{aligned}4x + 7y &= 2 \\4\left(\frac{11}{71}\right) + 7y &= 2 \\ \frac{44}{71} + 7y &= 2 \\71\left(\frac{44}{71} + 7y\right) &= 71(2) \\44 + 497y &= 142 \\497y &= 142 - 44 \\497y &= 98 \\y &= \frac{98}{497}\end{aligned}$$

The solution for the system of equations is $\left(\frac{11}{71}, \frac{98}{497}\right)$.