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.

\[ 4x + 7y = 2 \]
\[ 9x - 2y = 1 \]
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 \( x \)

\[ 4x - 3y = 2 \]
\[ 4x - 3\left(-\frac{5}{2}x - \frac{9}{2}\right) = 2 \]
\[ 4x + \frac{15}{2}x + \frac{27}{2} = 2 \]
\[ 2\left(4x + \frac{15}{2}x + \frac{27}{2}\right) = 2(2) \]
\[ 8x + 15x + 27 = 4 \]
\[ 23x = 4 - 27 \]
\[ 23x = -23 \]
\[ x = -1 \]

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.

\[
\begin{align*}
x + y &= 20 \\
x &= y - 4
\end{align*}
\]

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

\[
\begin{align*}
x + y &= 20 \\
(y - 4) + y &= 20 \\
2y - 4 &= 20 \\
2y &= 20 + 4 \\
2y &= 24 \\
y &= 12
\end{align*}
\]

Substitute the value of \(y\) into the second equation to find \(x\)

\[
\begin{align*}
x &= y - 4 \\
x &= 12 - 4 \\
x &= 8
\end{align*}
\]

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.

\[
\begin{align*}
2x - 3y &= -16 \\
6x - 7y &= 16
\end{align*}
\]

Solve the first equation for one of the variables

\[
\begin{align*}
2x - 3y &= -16 \\
2x &= 3y - 16 \\
x &= \frac{3}{2}y - 8
\end{align*}
\]
Exercise 3 (Continued):

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

\[ 6x - 7y = 16 \]
\[ 6\left(\frac{3}{2}y - 8\right) - 7y = 16 \]
\[ 9y - 48 - 7y = 16 \]
\[ 2y - 48 = 16 \]
\[ 2y = 48 + 16 \]
\[ 2y = 64 \]
\[ y = 32 \]

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

\[ 2x - 3y = -16 \]
\[ 2x - 3(32) = -16 \]
\[ 2x - 96 = -16 \]
\[ 2x = -16 + 96 \]
\[ 2x = 80 \]
\[ x = 40 \]

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.

\[ 6x + 7y = 17 \]
\[ 3x + y = -4 \]

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

\[ 3x + y = -4 \]
\[ y = -4 - 3x \]
\[ y = -3x - 4 \]
Exercise 4 (Continued):

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

$6x + 7y = 17$
$6x + 7(-3x - 4) = 17$
$6x - 21x - 28 = 17$
$-15x - 28 = 17$
$-15x = 17 + 28$
$-15x = 45$
$x = -3$

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

$3x + y = -4$
$3(-3) + y = -4$
$-9 + y = -4$
$y = -4 + 9$
$y = 5$

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.

$4x + 7y = 2$
$9x - 2y = 1$

Solve the first equation for one of the variables

$4x + 7y = 2$
$7y = -4x + 2$
$y = -\frac{4}{7}x + \frac{2}{7}$
Exercise 5 (Continued):

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

\[
9x - 2\left(-\frac{4}{7}x + \frac{2}{7}\right) = 1
\]
\[
9x + \frac{8}{7}x - \frac{4}{7} = 1
\]
\[
7\left(9x + \frac{8}{7}x - \frac{4}{7}\right) = 7\quad(1)
\]
\[
63x + 8x - 4 = 7
\]
\[
71x - 4 = 7
\]
\[
71x = 7 + 4
\]
\[
71x = 11
\]
\[
x = \frac{11}{71}
\]

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

\[
4x + 7y = 2
\]
\[
4\left(\frac{11}{71}\right) + 7y = 2
\]
\[
\frac{44}{71} + 7y = 2
\]
\[
71\left(\frac{44}{71} + 7y\right) = 71\quad(2)
\]
\[
44 + 497y = 142
\]
\[
497y = 142 - 44
\]
\[
497y = 98
\]
\[
y = \frac{98}{497}
\]

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