Practice
Solving Equations: Solving Systems of Equations

Answer these problems, then check your answers using the key on the next page. If you missed something, look at the solutions after the answer key, and if you still don't understand, watch the review video again.

#1) Solve the system twice, first by the substitution method, then by the elimination method:

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

Substitution Method

Elimination Method

#2) Find the intersection point twice, first by the substitution method, then by the elimination method:

$$\begin{cases} 7x+2y=3 \\ 2x-3y=8 \end{cases}$$

Substitution Method

Elimination Method

#3) Solve the system twice, first by the substitution method, then by the elimination method:

$$\begin{cases} 3x+4y=1 \\ x-2y=3 \end{cases}$$

Substitution Method

Elimination Method

#4) Solve the system using the substitution method by solving the top equation for x and substituting for x into the bottom equation:

$$\begin{cases} y^2=5-x \\ x+5y=11 \end{cases}$$

#5) Re-solve the system from problem 4 using the substitution method, but this time, solving the bottom equation for y and substituting for y into the top equation:

$$\begin{cases} y^2=5-x \\ x+5y=11 \end{cases}$$

#6) Solve the system using the substitution method: $\begin{cases} y = x^2 \\ y = 3x - 2 \end{cases}$

#7) Solve the system using the substitution method: $\begin{cases} y = x^2 + 1 \\ x + y = 3 \end{cases}$

Answers:

#1) $(-4,-6)$

#2) $(1,-2)$

#3) $\left(\frac{7}{5},-\frac{4}{5}\right)$

#4) $(1,2)$ *and* $(-4,3)$

#5) $(1,2)$ *and* $(-4,3)$

#6) $(1,1)$ *and* $(2,4)$

#7) $(-2,5)$ *and* $(1,2)$

Solutions:

#1) Solve the system twice, first by the substitution method, then by the elimination method:

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

Substitution Method

$3x - 2y = 0$

$-3x \quad -3x$

$-2y = -3x$

$\frac{-2y}{-2} = \frac{-3x}{-2}$

$y = \frac{3}{2}x$

$4x - 3y = 2$

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

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

$8x - 9x = 4$

$-x = 4$

$x = -4$

$3x - 2y = 0$

$3(-4) - 2y = 0$

$-12 - 2y = 0$

$+12 \quad +12$

$-2y = 12$

$\frac{-2y}{-2} = \frac{12}{-2}$

$y = -6$

$(-4, -6)$

Elimination Method

$4(3x - 2y = 0)$

$-3(4x - 3y = 2)$

$12x - 8y = 0$

$+ \quad -12x + 9y = -6$

$y = -6$

$3x - 2y = 0$

$3x - 2(-6) = 0$

$3x + 12 = 0$

$-12 \quad -12$

$\frac{3x}{3} = \frac{-12}{3}$

$x = -4$

$(-4, -6)$

#2) Find the intersection point twice, first by the substitution method, then by the elimination method:

$$\begin{cases} 7x + 2y = 3 \\ 2x - 3y = 8 \end{cases}$$

Substitution Method

$7x + 2y = 3$

$-2y \quad -2y$

$\frac{7x}{7} = \frac{3 - 2y}{7}$

$x = \frac{3 - 2y}{7}$

$2x - 3y = 8$

$7\left(2\left(\frac{3-2y}{7}\right) - 3y\right) = (8)7$

$2(3 - 2y) - 21y = 56$

$6 - 4y - 21y = 56$

$6 - 25y = 56$

$-6 \quad -6$

$-25y = 50$

$\frac{-25y}{-25} = \frac{50}{-25}$

$y = -2$

$2x - 3y = 8$

$2x - 3(-2) = 8$

$2x + 6 = 8$

$-6 \quad -6$

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

$x = 1$

$(1, -2)$

Elimination Method

$3(7x + 2y = 3)$

$2(2x - 3y = 8)$

$21x + 6y = 9$

$+ \quad 4x - 6y = 16$

$25x = 25$

$\frac{25x}{25} = \frac{25}{25}$

$x = 1$

$2x - 3y = 8$

$2(1) - 3y = 8$

$2 - 3y = 8$

$-2 \quad -2$

$-3y = 6$

$\frac{-3y}{-3} = \frac{6}{-3}$

$y = -2$

$(1, -2)$

#3) Solve the system twice, first by the substitution method, then by the elimination method:

$$\begin{cases} 3x+4y=1 \\ x-2y=3 \end{cases}$$

Substitution Method

$x-2y=3$
$+2y \quad +2y$
$x=2y+3$
$3x+4y=1$
$3(2y+3)+4y=1$
$6y+9+4y=1$
$10y+9=1$
$-9 \quad -9$
$10y=-8$
$\frac{10y}{10}=\frac{-8}{10}$
$y=\frac{-8}{10}=\frac{-4}{5}$

$x-2y=3$
$x-2\left(\frac{-4}{5}\right)=3$
$5\left(x+\frac{8}{5}\right)=(3)5$
$5x+8=15$
$-8 \quad -8$
$5x=7$
$\frac{5x}{5}=\frac{7}{5}$
$x=\frac{7}{5}$

$\left(\frac{7}{5}, \frac{-4}{5}\right)$

Elimination Method

$3x+4y=1$
$-3(x-2y=3)$

$3x+4y=1$
$+ \quad -3x+6y=-9$
$10y=-8$
$\frac{10y}{10}=\frac{-8}{10}$
$y=\frac{-8}{10}=\frac{-4}{5}$

$\left(\frac{7}{5}, \frac{-4}{5}\right)$

$x-2y=3$
$x-2\left(\frac{-4}{5}\right)=3$
$x+\frac{8}{5}=3$
$5\left(x+\frac{8}{5}\right)=(3)5$
$5x+8=15$
$-8 \quad -8$
$\frac{5x}{5}=\frac{7}{5} \quad x=\frac{7}{5}$

#4) Solve the system using the substitution method by solving the top equation for x and substituting for x into the bottom equation:

$$\begin{cases} y^2=5-x \\ x+5y=11 \end{cases}$$

$y^2=5-x$
$+x \quad +x$
$x+y^2=5$
$-y^2 \quad -y^2$
$x=5-y^2$

$(x)+5y=11$
$(5-y^2)+5y=11$
$5-y^2+5y=11$
$-11 \quad -11$
$(-y^2+5y-6=0)\cdot -1$
$y^2-5y+6=0$

$y^2-5y+6=0$
$(y-2)(y-3)=0$
$y=2 \quad y=3$
$x=5-y^2$
$x=5-(2)^2 \quad x=5-(3)^2$
$x=5-4 \quad x=5-9$
$x=1 \quad x=-4$

$(1,2)$ (x y) $\quad (-4,3)$ (x y)

#5) Re-solve the system from problem 4 using the substitution method, but this time, solving the bottom equation for y and substituting for y into the top equation:

$$\begin{cases} y^2=5-x \\ x+5y=11 \end{cases}$$

$x+5y=11$
$-x \quad -x$
$5y=11-x$
$\frac{5y}{5}=\frac{11-x}{5}$
$y=\frac{11-x}{5}$

$y^2=5-x$
$\left(\frac{11-x}{5}\right)^2=5-x$
$\frac{(11-x)^2}{5^2}=5-x$
$\frac{(11-x)(11-x)}{25}=5-x$
$\frac{121-11x-11x+x^2}{25}=5-x$
$25\left(\frac{121-22x+x^2}{25}\right)=(5-x)25$

$x^2-22x+121=125-25x$
$+25x \; -125 \quad -125 \; +25x$
$x^2+3x-4=0$
$(x-1)(x+4)=0$
$x=1 \quad x=-4$
$y=\frac{11-x}{5} \quad y=\frac{11-(-4)}{5}$
$y=\frac{11-1}{5} \quad y=3$
$y=2 \quad (1,2) \quad (-4,3)$

Which way was easier? It's hard to say, and hard to tell until you try a way. Both ways work, though :)

#6) Solve the system using the substitution method: $\begin{cases} y = x^2 \\ y = 3x - 2 \end{cases}$

$y = x^2$

$y = 3x - 2$

$x^2 = 3x - 2$

$-3x \quad -3x$

$x^2 - 3x = -2$

$+2 \quad +2$

$x^2 - 3x + 2 = 0$

$(x - 1)(x - 2) = 0$

$x = 1 \quad x = 2$

$y = x^2$

$x = 1$, $y = (1)^2$, $y = 1$, $(1, 1)$

$x = 2$, $y = (2)^2$, $y = 4$, $(2, 4)$

#7) Solve the system using the substitution method: $\begin{cases} y = x^2 + 1 \\ x + y = 3 \end{cases}$

$x + y = 3$

$-x \quad -x$

$y = 3 - x$

$y = x^2 + 1$

$3 - x = x^2 + 1$

$+x \quad +x$

$3 = x^2 + x + 1$

$-3 \quad -3$

$0 = x^2 + x - 2$

$x^2 + x - 2 = 0$

$x^2 + x - 2 = 0$

$(x + 2)(x - 1) = 0$

$x = -2 \quad x = 1$

$y = x^2 + 1$, $y = (-2)^2 + 1$, $y = 4 + 1$, $y = 5$, $(-2, 5)$

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