

For 1 - 3, solve the system by substitution.

1)  $x + 2y = 1$       $x = 1 - 2y$   
 $5x - 4y = -23$

$5 - 10y - 4y = -23$   
 $-14y = -28$   
 $y = 2$   
 $x = -3$

$(-3, 2)$

2)  $x - y = 3$       $x = 3 + y$   
 $x - y^2 = 1$

$3 + y - y^2 = 1$   
 $0 = y^2 - y - 2$   
 $0 = (y - 2)(y + 1)$   
 $y = 2$       $y = -1$   
 $x = 5$       $x = 2$

$(5, 2)$       $(2, -1)$

3)  $2x - y + 3 = 0$       $y = 2x + 3$   
 $x^2 + y^2 - 4x = 0$

$x^2 + (2x + 3)^2 - 4x = 0$   
 $x^2 + 4x^2 + 12x + 9 - 4x = 0$   
 $5x^2 + 8x + 9 = 0$   
 ~~$(5x)(x) + 9 = 0$~~

$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$   
 $= \frac{-8 \pm \sqrt{64 - 180}}{10}$

No Solution

For 4 - 6, solve the system by elimination.

4)  $2x - y = 3$   
 $4x + 3y = 21$

$-4x + 2y = -6$   


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 $5y = 15$   
 $y = 3$   
 $2x - 3 = 3$   
 $x = 3$

$(3, 3)$

5)  $3x + 2y = 3$   
 $6x + 4y = 14$

$-6x - 4y = -6$   


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 $0 \neq 8$

No Solution

$$6) \begin{cases} 5x + y = 10 \\ 2x + .4y = 4 \end{cases}$$

$$\begin{array}{r} -10x + -2y = -20 \\ 10x + 2y = 20 \\ \hline 0 + 0 = 0 \\ 0 = 0 \end{array}$$

Infinite # of Solutions

7) A total of \$32,000 is invested in two municipal bonds that pay 5.75% and 6.25% simple interest. The investor wants an annual interest income of \$1900 from the investments. How much should be invested in each type of bond?

$$\begin{aligned} x + y &= 32000 & x &= 32000 - y \\ .0575x + .0625y &= 1900 \\ .0575(32000 - y) + .0625y &= 1900 \\ 1840 - .0575y + .0625y &= 1900 \end{aligned}$$

\$12,000 @ 6.25%  
\$20,000 @ 5.75%

$$\begin{aligned} .005y &= 60 \\ y &= 12,000 \\ x &= 20,000 \end{aligned}$$

$$8) \begin{cases} 2x + 4y - z = 1 \\ 2x - 4y + 2z = -6 \\ x + 4y + z = 0 \end{cases}$$

$$\begin{aligned} \rightarrow z &= -1 + 2x + 4y \\ &= -1 + 2(-1) + 4\left(\frac{1}{2}\right) = -1 \end{aligned}$$

$$2x - 4y - 2 + 4x + 8y = -6$$

$$6x + 4y = -4 \rightarrow$$

$$6x + 4\left(\frac{1}{2}\right) = -4$$

$$6x + 2 = -4$$

$$6x = -6$$

$$x = -1$$

$$x + 4y + -1 + 2x + 4y = 0$$

$$3x + 8y = 1$$

~~$$-6x + 8y = 8$$~~

$$-6x - 16y = -2$$

$$6x + 4y = -4$$

$$\hline -12y = -6$$

$$y = \frac{1}{2}$$

$\left(-1, \frac{1}{2}, -1\right)$

$$\begin{aligned}
 9) \quad & 2x + y + 3z = 1 \quad \rightarrow y = 1 - 2x - 3z = 1 - \frac{6}{10} = \frac{4}{10} = \frac{2}{5} \\
 & 2x + 6y + 8z = 3 \\
 & 6x + 8y + 18z = 5
 \end{aligned}$$

$$\begin{aligned}
 2x + 6 - 12x - 18z + 8z &= 3 \\
 -10x - 10z &= -3 \quad \rightarrow -10x = -3
 \end{aligned}$$

$$\begin{aligned}
 6x + 8 - 16x - 24z + 18z &= 5 \\
 -10x - 6z &= -3 \quad x = \frac{3}{10}
 \end{aligned}$$

$$\begin{aligned}
 -10x - 6z &= -3 \\
 + 10x + 10z &= 3
 \end{aligned}$$

$$\boxed{\left(\frac{3}{10}, \frac{2}{5}, 0\right)}$$

$$\begin{aligned}
 10) \quad & 2x + y - z = 7 \quad 4z = 0 \\
 & x - 2y + 2z = -9 \quad z = 0 \\
 & 3x - y + z = 5 \quad \rightarrow z = 5 + y - 3x
 \end{aligned}$$

$$2x + y - 5 - y + 3x = 7$$

$$5x = 12$$

$$x = \frac{12}{5}$$

$$\begin{aligned}
 \frac{12}{5} - 2y + 2z &= -9 \\
 -2y + 2z &= -\frac{33}{5}
 \end{aligned}$$

$$\frac{36}{5} - y + z = 5$$

$$-y + z = \frac{-14}{5}$$

$$2y + -2z = \frac{28}{5}$$

$$-2y + 2z = \frac{5 \cdot 33}{5}$$

No Solution

OK -1

11) A small corporation borrowed \$800,000 to expand its line of toys. Some of the money was borrowed at 8%, some at 9%, and some at 10%. How much borrowed at each rate if the annual interest owed was \$67,000 and the amount borrowed at 8% was five times the amount borrowed at 10%?

$$x + y + z = 800,000$$

$$.08x + .09y + .1z = 67,000$$

$$x = 5z = 625,000$$

$$y + 6z = 800,000$$

$$.09y + .5z = 67,000$$

$$-.09y + -.54z = -72,000$$

$$-.04z = -5,000$$

$$z = 125,000$$

$$y = 50,000$$

\$625,000 @ 8%

\$50,000 @ 9%

\$125,000 @ 10%

