

9.1 Systems of Linear Equations
Honors Algebra 2 with Trig

1. Solve the system using substitution

$$-4x + 3y = 1$$

$$3x + y = 10$$

$$y = 10 - 3x$$

$$-4x + 3(10 - 3x) = 1$$

$$-4x + 30 - 9x = 1$$

$$-13x = -29$$

$$x = 29/13$$

$$y = 10 - 3(29/13)$$

$$= \frac{130}{13} - \frac{87}{13}$$

$$= 43/13$$

$$\boxed{(29/13, 43/13)}$$

2. Solve the system using elimination (also known as linear combination)

$$6x - 10y = 50$$

$$- (6x + 12y = 6)$$

$$-22y = 44$$

$$y = -2$$

$$(3x - 5y = 25) \cdot 2$$

$$(2x + 4y = 2) \cdot 3$$

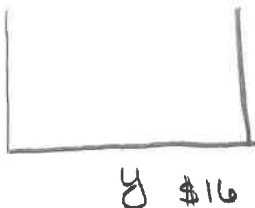
$$2x + 4(-2) = 2$$

$$2x - 8 = 2$$

$$x = 5$$

$$\boxed{(5, -2)}$$

3. A rectangular lot whose perimeter is 320 feet is fenced along three sides. An expensive fencing along the lot's length costs \$16 per foot, and an inexpensive fencing along the two widths costs only \$5 per foot. The total cost of the fencing along the three sides is \$2140. What are the lot's dimensions?



$$P = 320$$

$$2x + 2y = 320$$

$$\Rightarrow x + y = 160$$

$$5(2x) + 16(y) = 2140$$

$$10x + 16y = 2140$$

*substitution

$$y = 160 - x$$

$$10x + 16(160 - x) = 2140$$

$$10x + 2560 - 16x = 2140$$

$$-6x = -420$$

$$x = 70$$

$$y = 160 - 70$$

$$y = 90$$

$$\boxed{90 \text{ ft by } 70 \text{ ft}}$$

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4. Solve the system of three equations

1) eliminate x

$$\begin{array}{r} \textcircled{1} 2x + 4y - 6z = 100 \\ - \textcircled{2} 2x + y + 2z = 3 \\ \hline 3y - 8z = 97 \end{array}$$

$$\begin{array}{r} \textcircled{1} (x + 2y - 3z = 50)^2 \\ \textcircled{2} 2x + y + 2z = 3 \\ \textcircled{3} 2x - 5y + 4z = -79 \end{array}$$

$$\begin{array}{r} \textcircled{1} 2x + y + 2z = 3 \\ - \textcircled{3} 2x - 5y + 4z = -79 \\ \hline 6y - 2z = 82 \end{array}$$

1) eliminate one variable

why → get a 2 variable system

$$x + 2(11) - 3(-8) = 50$$

$$x + 46 = 50$$

$$x = 4$$

2) 2 variable system

$$\begin{array}{r} (3y - 8z = 97)^2 \\ 6y - 2z = 82 \end{array} \Rightarrow \begin{array}{r} 6y - 16z = 194 \\ - 6y - 2z = 82 \\ \hline -14z = 112 \\ z = -8 \end{array}$$

$(4, 11, -8)$

3) substitute & solve

$$6y - 2(-8) = 82 \quad y = 11$$

5. Solve the system of three equations

1) eliminate x

$$\begin{array}{r} \textcircled{1} -4x + 12y + 14z = 6 \\ \textcircled{2} -4x + 5y + 3z = 7 \\ \hline 7y + 11z = -1 \end{array}$$

$$7z - 3 = 2(x - 3y)$$

$$5y + 3z - 7 = 4x$$

$$4 + 5z = 3(2x - y)$$

$$\textcircled{1} -6x + 18y + 21z = 9$$

$$\textcircled{3} -6x + 3y + 5z = -4$$

$$\hline 15y + 16z = 13$$

$$\textcircled{1} -2x + 6y + 7z = 3$$

$$\textcircled{2} -4x + 5y + 3z = 7$$

$$\textcircled{3} -6x + 3y + 5z = -4$$

$$2) (7y + 11z = -1) \cdot 15$$

$$(15y + 16z = 13) \cdot 7$$

$$\begin{array}{r} 105y + 165z = -15 \\ - (105y + 112z = 91) \\ \hline 53z = -106 \end{array}$$

$$z = -2$$

$$7y + 11(-2) = -1$$

$$y = 3$$

$$-2x + 6(3) + 7(-2) = 3$$

$$-2x = -1$$

$$x = 1/2$$

$(1/2, 3, -2)$

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6. Solve the system of three equations

$$\begin{aligned} x + 3z &= -5 \rightarrow x = -5 - 3z \\ 5x - 2y &= -22 \\ 5y - 6z &= 36 \end{aligned}$$

$$\begin{aligned} \textcircled{1} \quad 5(-5 - 3z) - 2y &= -22 \\ -25 - 15z - 2y &= -22 \\ -2y - 15z &= 3 \end{aligned}$$

$$\begin{aligned} \textcircled{2} \quad (-2y - 15z = 3) \cdot 2 \\ (5y - 6z = 36) \cdot 5 \\ -4y - 30z = 6 \\ -(25y - 30z = 180) \\ \hline -29y = -174 \end{aligned}$$

$$y = 6$$

$$5x - 2(6) = -22$$

$$5x = -10$$

$$x = -2$$

$$\begin{aligned} -2 + 3z &= -5 \\ 3z &= -3 \\ z &= -1 \end{aligned}$$

$$\boxed{(-2, 6, -1)}$$

7. Find the quadratic equation $y = ax^2 + bx + c$ whose graph passes through the given points. $(-2, 7)$, $(1, -2)$, $(2, 3)$.

$$7 = 4a - 2b + c$$

$$-2 = a + b + c$$

$$3 = 4a + 2b + c$$

$$\boxed{y = 2x^2 - x - 3}$$

$$\begin{array}{r} 7 = 4a - 2b + c \\ -(-2 = a + b + c) \\ \hline 9 = 3a - 3b \end{array} \quad \begin{array}{r} -2 = a + b + c \\ -(3 = 4a + 2b + c) \\ \hline -5 = -3a - b \end{array}$$

$$9 = 3a - 3b$$

$$-5 = -3a - b$$

$$4 = -4b$$

$$-1 = b$$

$$9 = 3a - 3(-1)$$

$$6 = 3a$$

$$2 = a$$

$$-2 = 2 - 1 + c$$

$$-3 = c$$

