

Systems Assignment:

1. Solve the following using the addition/subtraction (linear combination) method.

$$\begin{array}{r}
 3x + y = 7 \\
 2x - 5y = -1
 \end{array}
 \quad
 \begin{array}{r}
 3x + y = 7 \rightarrow -2(3x + y = 7) \rightarrow -6x - 2y = -14 \\
 2x - 5y = -1 \rightarrow 3(2x - 5y = -1) \rightarrow 6x - 15y = -3 \\
 \hline
 2x - 5(1) = -1 \\
 2x = 4 \\
 x = 2
 \end{array}
 \quad
 \begin{array}{r}
 -6x - 2y = -14 \\
 6x - 15y = -3 \\
 \hline
 -17y = -17 \\
 y = 1
 \end{array}$$

← Substitution of $y = 1$
{ (2, 1) }

b) $2x + 8y = 7$
 $3x + 12y = 5$ { } or \emptyset

when solved the result is $0 =$ a number which indicates parallel lines which have no points in common resulting in the empty set as the solution set

c) $5x - 2y = 1$
 $4x + 5y = 47$ { (3, 7) }

d) $3x - 7y = -12$
 $-5x + 6y = 3$ { (3, 3) }

2. Solve using the substitution method.

a) $3x - y = 13$
 $2x - 3y = 16$

$$\begin{array}{r}
 3x - y = 13 \rightarrow 3x = y + 13 \rightarrow x = \frac{y + 13}{3} \\
 2x - 3y = 16 \\
 3 * 2 \left(\frac{y + 13}{3} \right) - 3y * 3 = 16 * 3 \\
 2y + 26 - 9y = 48 \\
 -7y = 22 \\
 y = -\frac{22}{7} \\
 \left\{ \left(\frac{23}{7}, -\frac{22}{7} \right) \right\}
 \end{array}
 \quad
 \begin{array}{r}
 7 * 3x = 7 * \left(-\frac{22}{7} \right) + 13 * 7 \\
 21x = -22 + 91 \\
 21x = 69 \\
 x = \frac{69}{21} = \frac{23}{7}
 \end{array}$$

b) $2x + y = 6$
 $3x - 2y = 2$ { (2, 2) }

$$\text{c) } \begin{cases} 3x - 2y = 1 \\ -2x + 4y = 7 \end{cases} \quad \left\{ \left(\frac{9}{4}, \frac{23}{8} \right) \right\}$$

$$\text{d) } \begin{cases} 2x + 3y = 7 \\ 3x + 4y = 10 \end{cases} \quad \{(2,1)\}$$

3. Solve using either method

$$\text{a) } \begin{cases} 3x - y = 8 \\ x + y = 4 \end{cases} \quad \{(3,1)\}$$

$$\text{b) } \begin{cases} 2x - y = -1 \\ 3x + y = 6 \end{cases} \quad \{(1,3)\}$$

$$\text{c) } \begin{cases} 2x + y = -2 \\ 2x - 3y = 15 \end{cases} \quad \left\{ \left(\frac{9}{8}, \frac{-17}{4} \right) \right\}$$

$$\text{d) } \begin{cases} 3x + 5y = 15 \\ x - y = 4 \end{cases} \quad \left\{ \left(\frac{35}{8}, \frac{3}{8} \right) \right\}$$

4. Use the substitution method to solve:

$$\begin{aligned} & x + y + z = 180 \\ \text{a) } & \begin{cases} y = 3x \\ z = 5x \end{cases} \quad \{(20,60,100)\} \end{aligned}$$

$$\text{b) } \begin{aligned} & x + y + 2z = 1 \\ & \begin{cases} x - y = 1 \\ x - z = 2 \end{cases} \quad \left\{ \left(\frac{3}{2}, \frac{1}{2}, -\frac{1}{2} \right) \right\} \end{aligned}$$

$$x + y + 2z = 1 \rightarrow$$

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

$$x - y = 1 \rightarrow -y = -x + 1 \rightarrow y = x - 1 \rightarrow y = \frac{3}{2} - 1 \rightarrow y = \frac{1}{2}$$

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

$$x - z = 2 \rightarrow -z = -x + 2 \rightarrow z = x - 2 \rightarrow z = \frac{3}{2} - 2 \rightarrow z = -\frac{1}{2}$$

$$4x - 5 = 1$$

$$4x = 6$$

$$x = \frac{6}{4} = \frac{3}{2}$$