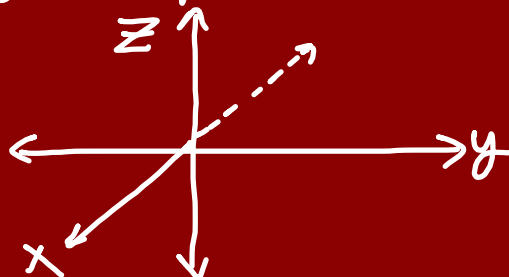


3-VARIABLE ELIMINATION

$$\begin{cases} x + 8y + 2z = -12 \\ 3x + y + 7z = 38 \\ 4x - 3y + 6z = 47 \end{cases}$$

- where 3 planes intersect



$$(2, -3, 5)$$

$\begin{matrix} x & y & z \end{matrix}$

$$(-4, 6, -2)$$

$$\begin{array}{r} \textcircled{1} \quad -3x - 24y - 6z = 36 \\ \textcircled{1} + \quad 3x + y + 7z = 38 \\ \hline \quad \quad -23y + z = 74 \end{array}$$

$$\begin{array}{r} \textcircled{2} \quad -4x - 32y - 8z = 48 \\ + \quad 4x - 3y + 6z = 47 \\ \hline \quad \quad -35y - 2z = 95 \end{array}$$

$$\begin{array}{r} \textcircled{3} \quad 2[-23y + z = 74] \\ \quad \quad -35y - 2z = 95 \end{array}$$

$$\begin{array}{r} \quad \quad -46y + 2z = 148 \\ + \quad \quad -35y - 2z = 95 \\ \hline \quad \quad -81y = 243 \\ \quad \quad \frac{-81y}{-81} = \frac{243}{-81} \\ \quad \quad y = -3 \end{array}$$

$$\begin{array}{r} \textcircled{4} \quad -23(-3) + z = 74 \\ \quad \quad 69 + z = 74 \\ \quad \quad z = 5 \end{array}$$

$$\begin{array}{r} \textcircled{5} \quad x + 8y + 2z = -12 \\ \quad \quad x + 8(-3) + 2(5) = -12 \\ \quad \quad x - 24 + 10 = -12 \\ \quad \quad x - 14 = -12 \\ \quad \quad \quad +14 \quad +14 \\ \quad \quad x = 2 \end{array}$$

$$(x, y, z)$$

$$(2, -3, 5)$$

Elimination

- 1) Group 2 equations + eliminate a variable.
- 2) Group a different pair of equations and eliminate the same variable.
- 3) Group the 2 resulting equations from steps 1 + 2 and eliminate another variable.
- 4) Sub 1st answer back into an eq. with 2 variables to get 2nd variable answer.
- 5) Sub both solutions into a 3-variable eq. + find the final variable.

CRAMER'S RULE

$$4x + 2y - z = 15$$

$$2x - y + 5z = 9$$

$$3x + 2y - z = 12$$

$$z = \frac{\begin{vmatrix} 4 & 2 & 15 \\ 2 & -1 & 9 \\ 3 & 2 & 12 \end{vmatrix}}{\begin{vmatrix} 4 & 2 & -1 \\ 2 & -1 & 5 \\ 3 & 2 & -1 \end{vmatrix}}$$

$$\begin{matrix} 1 \\ -9 \\ -17 \\ 59 \\ 5 \end{matrix}$$

$$x = \frac{\begin{matrix} =_1 & y_1 & z_1 \\ =_2 & y_2 & z_2 \\ =_3 & y_3 & z_3 \end{matrix}}{\begin{matrix} x_1 & y_1 & z_1 \\ x_2 & y_2 & z_2 \\ x_3 & y_3 & z_3 \end{matrix}}$$

$$4 \begin{vmatrix} -1 & 9 \\ 2 & 12 \end{vmatrix} - 2 \begin{vmatrix} 2 & 9 \\ 3 & 12 \end{vmatrix} + 15 \begin{vmatrix} 2 & -1 \\ 3 & 2 \end{vmatrix}$$

$$4 \begin{matrix} (-12 - 18) \\ -30 \end{matrix} - 2 \begin{matrix} (24 - 27) \\ -3 \end{matrix} + 15 \begin{matrix} (4 + 3) \\ 7 \end{matrix}$$

$$= -120 + 6 + 105 = -9$$

$$4 \begin{vmatrix} -1 & 5 \\ 2 & -1 \end{vmatrix} - 2 \begin{vmatrix} 2 & 5 \\ 3 & -1 \end{vmatrix} + -1 \begin{vmatrix} 2 & -1 \\ 3 & 2 \end{vmatrix}$$

$$4 \begin{matrix} (1 - 10) \\ -9 \end{matrix} - 2 \begin{matrix} (-2 - 15) \\ -17 \end{matrix} + -1 \begin{matrix} (4 + 3) \\ 7 \end{matrix}$$

$$-36 + 34 - 7 = -9$$

$$z = \frac{-9}{-9} = 1$$

~~18~~
 $x = \text{sofa}$
 $y = \text{love seat}$
 $z = \text{chairs}$

$$x + y = 1300$$

$$x + 2z = 1400$$

