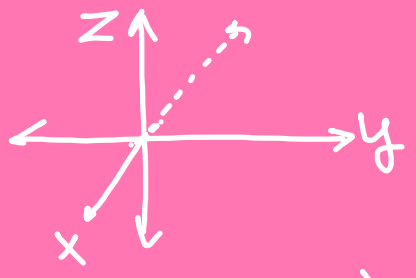
3-Variable Elimination

$$x + 8y + 2z = -12$$
$$3x + y + 7z = 38$$
$$4x - 3y + 6z = 47$$

Where 3 planes intersect



$(2, -3, 6)$
$(-4, 3, -1)$

① $-3[x + 8y + 2z = -12]$
$-3x - 24y - 6z = 36$
$+ \quad 3x + y + 7z = 38$
$-23y + z = 74$

② $-4[x - 3y + 6z = 47]$
$-4x - 32y - 8z = 48$
$+ \quad 4x - 3y + 6z = 47$
$-35y - 2z = 95$

③ $2[-23y + z = 74]$
$-46y + 2z = 148$
$+ \quad -35y - 2z = 95$
$\frac{-81y}{-81} = \frac{243}{-81}$
$y = -3$

④ $-23(-3) + z = 74$
$69 + z = 74$
$-69 \quad -69$
$z = 5$

⑤ $x + 8(-3) + 2(5) = -12$
$x + -24 + 10 = -12$
$x - 14 = -12$
$+14 \quad +14$
$x = 2$

(x, y, z)
$(2, -3, 5)$

3-Var. Elim.

1) Group 2 equations & eliminate a variable.

2) Group a different pair of equations & eliminate the SAME variable.

3) Group the 2 resulting equations (2-variables) & eliminate one variable. Solve for 1 one variable.

4) Sub answer into a 2-variable eq to find a 2nd variable.

5) Sub both answers into a 3-Var. eq. & solve.

CRAMER'S RULE

$$4x + 2y - z = 15$$
$$2x - y + 5z = 9$$
$$3x + 2y - z = 12$$

$$x = \frac{\begin{vmatrix} c_1 & y_1 & z_1 \\ c_2 & y_2 & z_2 \\ c_3 & y_3 & z_3 \end{vmatrix}}{\begin{vmatrix} x_1 & y_1 & z_1 \\ x_2 & y_2 & z_2 \\ x_3 & y_3 & z_3 \end{vmatrix}}$$

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

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

$$4(-9-60) - 15(-2-15) + -1(24-27)$$

$$-69 \qquad -17 \qquad -3$$

$$-276 + 255 + 3 = -18$$

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

$$4(1-10) - 2(-2-15) + -1(4+3)$$

$$-9 \qquad -17 \qquad 7$$

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

$$\frac{-9}{5} =$$

$$x = \frac{x + 2y = 1800}{x + z = 1800} \qquad y = \frac{-18}{-9} = 2$$

18/ Sofa + l.s. = 1300
Sofa + 2 chairs = 1400
Sofa, l.s., 1 chair = 1600

x = price of sofa
y = price of l.s.
z = price of chair

$x + y + 0z = 1300$
$x + 0y + 2z = 1400$
$x + y + z = 1600$

Calculator

$$\frac{\det([\,\,\,])}{\det([\,\,\,])}$$

det( )
Menu - 7 - 3