16-9 Cramer's Rule Part 2

Solving Systems with 3 equations & 3 variables Page 801

$$ax + by + cz = d$$

$$ex + fy + gz = h$$

$$ix + jy + kz = l$$

We need to find four matrices and calculate their determinants...

$$D_d = \begin{vmatrix} a & b & c \\ e & f & g \\ i & j & k \end{vmatrix}$$

$$D_x = \begin{vmatrix} d & b & c \\ h & f & g \\ l & j & k \end{vmatrix}$$

$$D_y = \begin{vmatrix} a & d & c \\ e & h & g \\ i & l & k \end{vmatrix}$$

$$D_z = \begin{vmatrix} a & b & d \\ e & f & h \\ i & j & l \end{vmatrix}$$

$$x = \frac{D_x}{D_d} \qquad y = \frac{D_y}{D_d} \qquad z = \frac{D_z}{D_d}$$

Ex 1) Solve the system of equations using Cramer's Rule.

$$x - 3y + 7z = 13$$
$$x + y + z = 1$$
$$x - 2y + 3z = 4$$

$$D_d = \begin{vmatrix} 1 & -3 & 7 \\ 1 & 1 & 1 \\ 1 & -2 & 3 \end{vmatrix}$$

$= +3 + -3 + -14 - 7 - -2 - -9$

$= -14 + 4 = \boxed{-10}$

$$D_x = \begin{vmatrix} 13 & -3 & 7 \\ 1 & 1 & 1 \\ 4 & -2 & 3 \end{vmatrix}$$

$= +39 + -12 + -14 - 28 - -26 - -9$

$= 13 + 7 = \boxed{20}$

$$D_y = \begin{vmatrix} 1 & 13 & 7 \\ 1 & 1 & 1 \\ 1 & 4 & 3 \end{vmatrix}$$

$= +3 + 13 + 28 - 7 - 4 - 39$

$44 - 50 = \boxed{-6}$

$$D_z = \begin{vmatrix} 1 & -3 & 13 \\ 1 & 1 & 1 \\ 1 & -2 & 4 \end{vmatrix}$$

$= +4 + -3 + -26 - 13 - -2 - -12$

$-25 + 1 = \boxed{-24}$

$$x = \frac{20}{-10} = -2$$

$$y = \frac{-6}{-10} = \frac{3}{5}$$

$$z = \frac{-24}{-10} = \frac{12}{5}$$

$\left(-2, \frac{3}{5}, \frac{12}{5}\right)$

consistent

independent