Nov 28, 2012

Cramer's Rule

$$x = \frac{D_x}{D} \qquad y = \frac{D_y}{D}$$

$$\det \begin{vmatrix} a & b \\ c & d \end{vmatrix} = ad - bc$$

Example

$$\begin{vmatrix} x & 3 \\ -2 & 5 \end{vmatrix} = (1)(5) - (3)(-2)$$

$$5 + 6 = \boxed{11} \checkmark$$

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x y A

$$3x - 2y = 10$$
$$4x - 3y = 15$$

$$D = \begin{vmatrix} x & y \\ 3 & -2 \\ 4 & -3 \end{vmatrix} = -9 - (-8) = -1$$

$$D_x = \begin{vmatrix} A & y \\ 10 & -2 \\ 15 & -3 \end{vmatrix} = (-30) - (-30) = 0$$

$$D_y = \begin{vmatrix} x & A \\ 3 & 10 \\ 4 & 15 \end{vmatrix} = 45 - (40) = 5$$

$$x = \frac{D_x}{D} = \frac{0}{-1} = 0$$

$$y = \frac{D_y}{D} = \frac{5}{-1} = -5$$

$(0, -5)$

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4.3.

Example 35

$C(x) = 200x + 6000$

$R(x) = 450x$

Break even

$C(x) = R(x)$

$200x + 6000 = 450x$

$-200x \qquad -200x$

$6000 = 250x$ ✓

$24 = x$

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Bonus 5pts all or nothing

$$\begin{aligned} 2x - 3y + z &= 5 \\ x + y + z &= 0 \\ 4x + 2y + 4z &= 4 \end{aligned}$$

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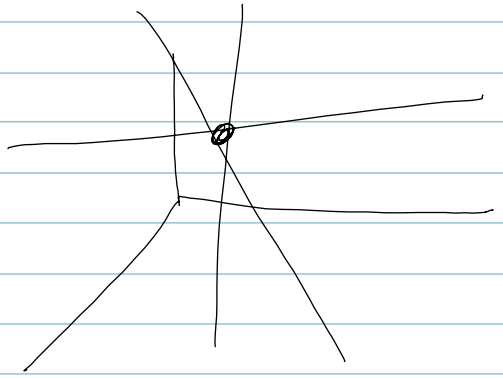
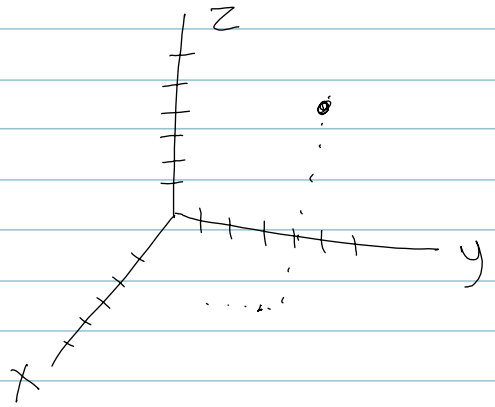
① $3x - y + z = -15$
② $x + 2y - z = 1$
③ $2x + 3y - 2z = 0$

(2, 4, 6)





3 x 3 → 2 x 2 → 1 answer

3rd answer — 2nd answer

(x, y, z)

① $3x - y + z = -15$
② $x + 2y - z = 1$

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④ $4x + y = -14$

2 ① $6x - 2y + 2z = -30$
③ $2x + 3y - 2z = 0$

⑤ $8x + y = -30$

④ $4x + y = -14$
⑤ $8x + y = -30$

-1 ④ $-4x - y = 14$
⑤ $8x + y = -30$

$4x = -16$

$\boxed{x = -4}$

$4x + y = -14$
$4(-4) + y = -14$
$-16 + y = -14$
$+16 \qquad +16$

$\boxed{y = 2}$

$3x - y + z = -15$
$3(-4) - 2 + z = -15$
$-12 - 2 + z = -15$
$-14 + z = -15$
$z = -1$

$(-4, 2, -1)$

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Cramer's Rule

$$X = \frac{Dx}{D}$$

$$Y = \frac{Dy}{D}$$

$$Z = \frac{Dz}{D}$$

$$D = \begin{vmatrix} x & y & z \\ 3 & -1 & 1 \\ 1 & 2 & -1 \\ 2 & 3 & -2 \end{vmatrix} \begin{matrix} 3 & -1 \\ 1 & 2 \\ 2 & 3 \end{matrix}$$

$$(-12 + 2 + 3) - (2 - 9 + 4)$$
$$-7 - (-3)$$
$$\boxed{-4}$$

$$D_x = \begin{vmatrix} A & y & z \\ -15 & -1 & 1 \\ 1 & 2 & -1 \\ 0 & 3 & -2 \end{vmatrix} \begin{matrix} -15 & -1 \\ 1 & 2 \\ 0 & 3 \end{matrix}$$

$$= (60 + 0 + 3) - (2 + 45 + 0)$$
$$63 - 47$$
$$= \boxed{16}$$

$$X = \frac{D_x}{D} = \frac{16}{-4} = \boxed{-4}$$

$$D_y = \begin{vmatrix} x & A & z \\ 3 & -15 & 1 \\ 1 & 1 & -1 \\ 2 & 0 & -2 \end{vmatrix} \begin{matrix} 3 & -15 \\ 1 & 1 \\ 2 & 0 \end{matrix}$$

$$= (-6 + 30 + 1) - (30 - 3 + 2)$$
$$= -8$$

$$D_z = \begin{vmatrix} x & y & A \\ 3 & -1 & -15 \\ 1 & 2 & 1 \\ 2 & 3 & 0 \end{vmatrix} = 4$$

$$y = \frac{D_y}{D} = \frac{-8}{-4} = 2$$

$$z = \frac{D_z}{D} = \frac{4}{-4} = -1$$