Homework Solution "Systems of Simultaneous Linear Equations"

(1) Evaluate the determinates of the following matrices:

$$\mathbf{D} = \begin{bmatrix} 24 \\ 15 \end{bmatrix} = (2)(5) - (1)(4) = 10 - 4 = \mathbf{6}$$

$$\mathbf{D} = \begin{bmatrix} (4)(11)(2) \\ (5)(10)(9) \\ (16)(6)(8) \end{bmatrix}$$

$$= (4)(10)(8) - (16)(10)(2) + (11)(9)(16) - (6)(9)(4) + (2)(5)(6) - (8)(5)(11)$$

$$= 320 - 320 + 1{,}584 - 216 + 60 - 440 = \mathbf{988}$$

(2) Solve the following system of equations using determinates:

$$x - 2y = 3$$

$$2x - 5y = 7$$

$$\begin{bmatrix} (1)(-2) \\ (2)(-5) \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 3 \\ 7 \end{bmatrix} \Rightarrow \mathbf{D} = \begin{bmatrix} (1)(-2) \\ (2)(-5) \end{bmatrix} = \mathbf{-1}$$

$$\boldsymbol{x} = \frac{Det \begin{bmatrix} (3)(-2) \\ (7)(-5) \end{bmatrix}}{-1} = \frac{-1}{-1} = \mathbf{1}$$

$$\mathbf{y} = \frac{Det \begin{bmatrix} (1)(3) \\ (7)(7) \end{bmatrix}}{-1} = \frac{1}{-1} = \mathbf{-1}$$

(3) Solve the following system of equations using either a math software program (i.e. Mathview, Mathcad, Mathematica, etc.) or your calculators matrices program. Note what you used.

$$x + y + z = 10$$

$$2x + 3y + 5z = -20$$

$$x - 2y - 3z = 100$$

Setting up the matrices gives the following…

$$\begin{bmatrix} (1)(1)(1) \\ (2)(3)(5) \\ (1)(-2)(-3) \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 10 \\ -20 \\ 100 \end{bmatrix}$$

Then using my calculator's matrices program…

$\boldsymbol{x}$ **= 38**

$\boldsymbol{y}$ **= -22**

$\boldsymbol{z}$ **= -6**

(4) Four gizmos and three whatsits cost \$42, while three gizmos and seven whatsits cost \$37. What's the price of each individual gizmo and whatsit?

First write a system of equations for the given information…

$$4g + 3w = \$42$$
$$3g + 7w = \$37$$

Setting up the matrices gives the following… Then using my calculator's matrices program…

$$\begin{bmatrix} (4)(3) \\ (3)(7) \end{bmatrix} \begin{bmatrix} g \\ w \end{bmatrix} = \begin{bmatrix} 42 \\ 37 \end{bmatrix}$$

g **= \$9.63**

w **= \$1.16**