Sec. 12.4/12.5 Using Martices To Solve Systems of Equations

Identity Property – IA = A and AI = A.

Inverse Matrix – Let A by a square n by n matrix. If there exists an n by n matrix A^{-1}, read A inverse for which $A\,A^{-1} = A^{-1}A = I$ then A^{-1} is called the inverse of matrix A.

On TI Calculator –
1. Enter Matrix
2. Clear Screen
3. Choose Matrix, then hit inverse button.
4. Hit enter. Inverse matrix will appear.

Ex: Solve the following system of equations using matrices. HINT: $X = A^{-1}B$.

$$\begin{cases} x + y = 3 \\ -x + 3y + 4z = -3 \\ 4y + 3z = 2 \end{cases}$$

$$AX = B$$
$$A^{-1}A\,X = A^{-1}B$$
$$X = A^{-1}B$$

$$A = \begin{bmatrix} 1 & 1 & 0 \\ -1 & 3 & 4 \\ 0 & 4 & 3 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 3 \\ -3 \\ 2 \end{bmatrix}$$

$$A \cdot X = B$$

$$X = \begin{bmatrix} 1 \\ 2 \\ -2 \end{bmatrix}$$

$$\begin{array}{l} x = 1 \\ y = 2 \\ z = -2 \end{array} \qquad (1, 2, -2)$$

Ex: A dietician at Cook County Hospital wants a patient to have a meal that has 65 grams of protein, 95 grams of carbohydrates, and 905 milligrams of calcium. The hospital food service tells the dietitian that the dinner for today is elk a la king, baked potatoes, and milk. Each serving of elk al a king has 30 grams of protein, 35 grams of carbohydrates, and 200 mg of calcium. Each serving of baked potatoes contains 4 grams of protein, 33 grams of carbohydrates, and 0 mg of calcium. Each glass of milk contains 9 grams of protein, 13 grams of carbohydrates, and 300 mg of calcium. How many servings of food should the dietitian provide for the patient?

PROTEIN → $30E + 4P + 9M = 65$
CARBON → $35E + 33P + 13M = 95$
CALCIUM → $200E + 200P + 300M = 905$

$$A = \begin{bmatrix} 30 & 4 & 9 \\ 35 & 33 & 13 \\ 200 & 10 & 300 \end{bmatrix} \begin{bmatrix} E \\ P \\ M \end{bmatrix} = \begin{bmatrix} 65 \\ 95 \\ 905 \end{bmatrix}$$

$$X = A^{-1}B$$
$$X = \begin{bmatrix} 1.5 \\ .5 \\ 2 \end{bmatrix}$$

$$\begin{array}{l} E = 1.5 \\ P = .5 \\ M = 2 \end{array}$$

HW: pg 773 #70,74,76,80,84

$1\frac{1}{2}$ servings of elk a la king
$\frac{1}{2}$ of a potato
2 glasses of milk