Applying Matrix Equations

4) A total of $10,000 was invested in two certificates of deposit that earned 6% per year and 8% per year. If the investments earned $750 in interest each year, find the amount invested at each rate. Write a matrix equation for each system of equations and use your calculator to solve using inverse matrices.

$x = $ amt of $ in 6% investment
$y = $ amt of $ in 8% investment

$$x + y = 10,000 \qquad \text{Solve } \underline{\text{w/out}} \text{ technology.}$$
$$.06x + .08y = 750$$

7) An animal feed is made up of corn, soybeans and cottonseed. One unit of corn provides 0.25 units of protein, 0.4 units of fat and 0.3 units of fiber. One unit of soybeans provides 0.4 units of protein, 0.2 units of fat and 0.2 units of fiber. One unit of cottonseed provides 0.2 units of protein, 0.3 units of fat and 0.1 units of fiber. How many units of each ingredient must be combined to make a feed that contains 22 units of protein, 28 units of fat and 18 units of fiber?

$x = $ units of corn $y = $ units of soybeans $z = $ units of cottonseed

	Corn(x)		Soy(y)		Cotton(z)		Totals
Protein	$.25x$	$+$	$.4y$	$+$	$.2z$	$=$	22
Fat	$.4x$	$+$	$.2y$	$+$	$.3z$	$=$	28
Fiber	$.3x$	$+$	$.2y$	$+$	$.1z$	$=$	18

So

$$\underbrace{\begin{bmatrix} .25 & .4 & .2 \\ .4 & .2 & .3 \\ .3 & .2 & .1 \end{bmatrix}}_{A} \underbrace{\begin{bmatrix} x \\ y \\ z \end{bmatrix}}_{X} = \underbrace{\begin{bmatrix} 22 \\ 28 \\ 18 \end{bmatrix}}_{B}$$

$$X = A^{-1}B \quad \text{Use technology!}$$

10. An accountant for a company is creating part of the fiscal budget for next year. She has $500,000 to allocate between salaries, insurance, and general expenses. Based on previous financial statements, she expects to spend eight times as much on salaries x as on insurance y. Also, general expenses z historically cost 20% of the amount spent on salaries and insurance combined.

$x = 8y \rightarrow x - 8y = 0$

x - salary budget y - insurance budget z - general expenses

a. Writing a System Write a system of equations for the amount allocated to each category.

$x + y + z = 500,000$

$x - 8y \quad = 0$

$.2x + .2y - z = 0$

$z = .2(x + y)$

$z = .2x + .2y$

$.2x + .2y - z = 0$

b. Writing a Matrix Equation Write the system of equations from part (a) as a matrix equation ~~AX5 B.~~ IDK what this is!

$$\begin{bmatrix} 1 & 1 & 1 \\ 1 & -8 & 0 \\ .2 & .2 & -1 \end{bmatrix} \begin{bmatrix} x \\ y \\ z \end{bmatrix} = \begin{bmatrix} 500,000 \\ 0 \\ 0 \end{bmatrix}$$

$\quad\quad A \quad\quad\quad X = \quad B$

c. Solving a System Use an inverse matrix to solve the system of equations. How much is allocated to each category?

$X = A^{-1}B$

$$X = \begin{bmatrix} 370,370.37 \\ 46,296.30 \\ 83,333.33 \end{bmatrix}$$

The salary budget is $370,370, insurance is $46,296, and general expenses is $83,333.