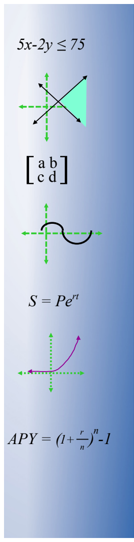

Math 1090 ~ Business Algebra

Section 2.4 Inverse Matrices

Objectives:
- Use Gauss-Jordan techniques to find an inverse of a matrix, if it exists.
- Use inverse matrices to solve systems of equations.

Inverse Matrix

A^{-1}, read "A inverse," is a matrix such that
- $A^{-1} \cdot A = I = A \cdot A^{-1}$
- A^{-1} can only exist for a square matrix

Ex 1: Find A^{-1} for

a) $A = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

b) $A = \begin{bmatrix} 5 & 4 \\ 0 & 2 \end{bmatrix}$

Method to find A^{-1} for A
1. If A is not square, A^{-1} does not exist (DNE).
2. If A is square,

   a) Augment A with the identity matrix.

   b) Perform elementary row operations on the augmented matrix until the left side is I, the identity matrix.

   c) What is on the right side is A^{-1}.

Ex 2: Find A^{-1} if possible.

a) $A = \begin{bmatrix} 1 & 3 & 5 & 7 \\ -5 & 1 & 0 & 1 \\ 3 & -2 & 7 & 0 \end{bmatrix}$

b) $A = \begin{bmatrix} 7 & -4 & 6 \\ 7 & -4 & 5 \\ 2 & -1 & 1 \end{bmatrix}$

Ex 3: Use A^{-1} from Example 2(b) to solve this system of equations.

$$7x - 4y + 6z = 1$$
$$7x - 4y + 5z = 0$$
$$2x - y + z = 7$$

To solve

$AX=B$

(where A is an nxn matrix

X is an $nx1$ column vector of variables

B is an $nx1$ column vector of constants)

we can left-multiply both sides by A^{-1}.

$A^{-1}AX = A^{-1}B$

$IX = A^{-1}B$.