Warm Up

Solve the following system of equations and identify the type of system...

$$3x + 2y + z = 3$$

 $x - 3y + z = 4$
 $-6x - 4y - 2z = 1$

$$3x + 3y + z = 3$$

$$x - 3y + z = 4$$

$$3x + 3y + z = 3$$

$$x - 3y + z = 4$$

$$3x + 3y + z = 3$$

$$x - 3y + z = 4$$

$$3x + 3y + z = 4$$

$$4y - 6x - 4y - 2z = 1$$

$$3x + 3y + z = 3$$

$$3x + 3y + z = 3$$

$$4x - 6y + 3z = 8$$

$$-6x - 4y - 2z = 1$$

$$4x+10y=-3$$
 No Solution
(+) $-4x-10y=9$ $= 9$ $= 1$ Inconsistent System

Questions from homework

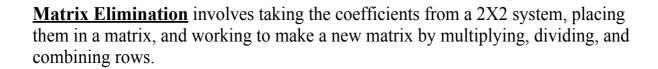
Determinant Method

3) Inverse =
$$\frac{1}{Det} \begin{bmatrix} d - b \\ -c a \end{bmatrix}$$

= $\frac{1}{6} \begin{bmatrix} 1 & 3 \\ -1 & 4 \end{bmatrix} = \begin{bmatrix} \frac{1}{6} & \frac{1}{3} \\ -\frac{1}{6} & \frac{3}{3} \end{bmatrix}$

@ Unit Matrix Method

Solving Equations Using Matrices



The combination of the coefficients from a system of equations and their solutions in an equivalent form is called an **augmented matrix**.

Ex.
$$2x + y + 3z = 0$$

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

$$\begin{pmatrix} 2 & 1 & 3 & 0 \\ 1 & 1 & -2 & -1 \\ 1 & -2 & -1 & 3 \end{pmatrix}$$

$$\begin{array}{ccc} x + 3y = 4 \\ 3x + 4y = 2 \end{array} \longrightarrow \begin{pmatrix} 1 & 3 & 4 \\ 3 & 4 & 2 \end{pmatrix}$$

Row Reduced Echelon Form

The goal in solving a system of equation using matrices is to obtain a new matrix - row reduced echelon form of a matrix. It takes the form:

$$\begin{pmatrix} 1 & 0 & x \\ 0 & 1 & y \end{pmatrix} \qquad \mathbf{Or} \qquad \begin{pmatrix} 1 & \# & \# & x \\ 0 & 1 & \# & y \\ 0 & 0 & 1 & z \end{pmatrix}$$

To reduce a matrix to its row echelon form, we can:

- a) Multiply or divide a row by a constant.
- b) Add or subtract one row from another.
- c) Interchange rows.

Solve the following system of equations using an augmented matrix reduced to its row echelon form...

$$x + 3y = 4$$
$$3x + 4y = 2$$

$$30 - 60 = 3 + 3 = 4$$

$$30 - 60 = 3 + 3 = 4$$

$$5y = 10$$

$$y = 3$$

$$x + 3y = 4$$

$$x + 3(3) = 4$$

$$x + 6 = 4$$

$$x = -3$$

Try this one on your own...

$$3x + 2y = 12$$

$$2x + 3y = 13$$

- 1. Express system in the form of an augmented matrix
- 2. Eliminate "x" in equation 2 and 3.
- 3. Eliminate "y" in equation 3 (must add/subtract 2 and 3)
- 4. Create triangle of zeroes and solve.

Ex.
$$2x + y - z = -1$$

 $3x - y + 2z = 8$
 $2x + 2y - 3z = -6$

$$\begin{array}{lll}
-3z = -6 & -8y + 13z = 34 & 3x + y - z = -1 \\
\hline
[z = 3] & -8y + (3i3) = 34 & 3x + (-1) - (2) = -1
\end{array}$$

$$-8y + 36 = 34 & 3x = 3$$

$$-8y = 8 & 4x = 3$$

Homework