Review of Inverses

A matrix has an inverse if:

- It is Square
- The $det(A) \neq 0$

If the det(A)=0 then the matrix is SINGULAR

The determinant of a 2x2 matrix is ad-bc a b

Inverse of a 2x2 Matrix

$$\begin{pmatrix} a & b \\ c & d \end{pmatrix}^{-1} = \frac{1}{ad - bc} \begin{pmatrix} d & -b \\ -c & a \end{pmatrix}$$

Inverse of a 3x3 Matrix

Plug into your calculator

$$\left(\begin{array}{cccc}
3 & -3 & 6 \\
1 & -3 & 10 \\
-1 & 3 & -5
\end{array}\right)$$

Matrices with Inverses

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Solving with inverses:

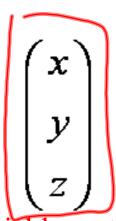
$$x - 3y + z = 4$$

$$-y - 4z = 7$$

$$5x - 13y + 13z = 8$$

coefficient matrix

$$\begin{pmatrix} 1 & -3 & 1 \\ 0 & -1 & -4 \\ 5 & -13 & 13 \end{pmatrix}$$



answer matrix

(4)
7
8)

variable matrix

coefficient matrix
$$\begin{pmatrix}
1 & -3 & 1 \\
0 & -1 & -4 \\
5 & -13 & 13
\end{pmatrix}$$

$$\begin{pmatrix}
x \\
y \\
z
\end{pmatrix}$$
variable matrix
$$\begin{pmatrix}
x \\
y \\
z
\end{pmatrix}$$
to solve:
$$\begin{pmatrix}
x \\
y \\
z
\end{pmatrix}$$

you have to have the same number of variables as equations to use this method

possible answers:

you obtain solutions

singular matrix - no solutions (because there was no inverse for C)

2x2 Matricies: BY HAND
$$3x - 2y = 0$$

$$-x + y = 5$$

$$3 - 2 \begin{bmatrix} 3 & -2 \\ -1 & 1 \end{bmatrix} \begin{bmatrix} x \\ y \end{bmatrix} = \begin{bmatrix} 0 \\ 5 \end{bmatrix}$$

$$-x + y = 5$$

$$1 - 2 \begin{bmatrix} 1 & 2 \\ 3 & 2 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ -1 & 2 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix}$$

$$1 - 2 \begin{bmatrix} 1 & 3 \\ 1 & 3 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix} \begin{bmatrix} 1 & 2 \\ 1 & 3 \end{bmatrix}$$

Solve using inverse matrices:

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

$$x + 2y - 3z = 9$$

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

$$\begin{bmatrix} 2 & -1 & 1 \\ 2 & -3 & 2 \\ 3 & -2 & 1 \end{bmatrix}$$