**Review of Inverses**

A matrix has an inverse if:

- It is Square
- The det(A)≠0

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

The determinant of a 2x2 matrix is ad-bc

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**Inverse of a 2x2 Matrix**

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

\[
\begin{pmatrix}
3 & 1 \\
4 & 2
\end{pmatrix}
\]
Inverse of a 3x3 Matrix

Plug into your calculator

\[
\begin{pmatrix}
3 & -3 & 6 \\
1 & -3 & 10 \\
-1 & 3 & -5 \\
\end{pmatrix}
\]

Matrices with Inverses

Solving with inverses:

\[
\begin{align*}
x - 3y + z &= 4 \\
-y - 4z &= 7 \\
5x - 13y + 13z &= 8
\end{align*}
\]

Coefficient matrix

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

Answer matrix

\[
\begin{pmatrix}
x \\
y \\
z
\end{pmatrix}
= \begin{pmatrix} 4 \\ 7 \\ 8 \end{pmatrix}
\]

Variable matrix
March 14, 2013

coefficient matrix

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

variable matrix

\[
\begin{pmatrix}
x \\
y \\
z \\
\end{pmatrix}
\]

answer matrix

\[
\begin{pmatrix}
4 \\
7 \\
8 \\
\end{pmatrix}
\]

to solve:

\[
C \cdot V = A
\]

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 Matrices: BY HAND

\[ 3x - 2y = 0 \]
\[-x + y = 5 \]

Solve using inverse matrices:

\[ 2x - y + z = -6 \]
\[ x + 2y - 3z = 9 \]
\[ 3x - 2y + z = -3 \]