

Inverse of a Matrix

Name: _____ Date: _____

There is no such thing as division of matrices, however we can use the inverse of a matrix to perform operations and solve problems that are analogous to division.

The inverse of a matrix is like the **reciprocal** of a number.

Multiplying a Matrix by its Inverse

When we multiply a matrix by its inverse we get the identity matrix.

$$A \times A^{-1} = I$$

Definition

The inverse of A is A^{-1} only when

$$A \times A^{-1} = A^{-1} \times A = I$$

Sometimes there is no inverse at all.

Calculating the Inverse Matrix

We will do a derivation in class to show how to find the inverse of a 2x2 matrix. However, for simplicity it will be shown here.

Simply **swap** the positions of a and d , put **negatives** in front of b and c , and divide everything by the **determinant** ($ad - bc$)

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

Important: If the determinant of a matrix is **zero**, then the *inverse does not exist*.

Calculate the inverse of the following matrices and check that it is correct. Find the determinant first to be sure that the inverse exists.

1. $A = \begin{bmatrix} 4 & 7 \\ 2 & 6 \end{bmatrix}$

2. $B = \begin{bmatrix} 2 & 0 \\ 3 & -6 \end{bmatrix}$

3. $C = \begin{bmatrix} 4 & 6 \\ -2 & 3 \end{bmatrix}$