Operation Identity:

$3 \bullet 1 = 3$

$4 + 0 = 4$

$x * 1 = x$

$w + 0 = w$

1 is the multiplicative identity for real numbers

0 is the additive identity for real numbers

Find w, x, y, and z:

$$\begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix} * \begin{bmatrix} w & x \\ y & z \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix}$$

$$\begin{bmatrix} (2w + y) & (2x + z) \\ (4w + 3y) & (4x + 3z) \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix}$$

$$\begin{cases} 2w + y = 2 \\ 4w + 3y = 4 \end{cases} \quad \text{and} \quad \begin{cases} 2x + z = 1 \\ 4x + 3z = 3 \end{cases}$$

$w = 1$
$x = 0$
$y = 0$
$z = 1$

$$\begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix} * \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix} = \begin{bmatrix} 2 & 1 \\ 4 & 3 \end{bmatrix}$$

$\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$ is the **Multiplicative Identity** for any **2 by 2 matrix**.

What would be the Multiplicative Identity for any 3 by 3 matrix?

Demonstrate your conclusion.by multiplying it by $\begin{bmatrix} a & b & c \\ d & e & f \\ g & h & i \end{bmatrix}$.

Inverses

$2 * \frac{1}{2} = 1$

Since the multiplication results in the Multiplicative Identity,
2 and $\frac{1}{2}$ are **Multiplicative Inverses** of each other.

4 + (-4) = 0
Since the Addition results in the Additive Identity,
4 and -4 are **Additive Inverses** of each other.

Find the Multiplicative Inverse of $\begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix}$ Use Decimals

$$\begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix} * \begin{bmatrix} w & x \\ y & z \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

$\begin{bmatrix} 0.3 & -0.1 \\ -0.2 & 0.4 \end{bmatrix}$ is the Multiplicative Inverse, because

$$\begin{bmatrix} 4 & 1 \\ 2 & 3 \end{bmatrix} * \begin{bmatrix} 0.3 & -0.1 \\ -0.2 & 0.4 \end{bmatrix} = \begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$$

Find the Multiplicative Inverse of $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ Call it $\begin{bmatrix} w & x \\ y & z \end{bmatrix}$

Answer:

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

Note the Pattern:
Switch elements on the Primary Diagonal.
Switch signs on the Secondary Diagonal.
Divide Each by the Determinant of the Original Matrix.

Find the Multiplicative Inverse of $\begin{bmatrix} 8 & 4 \\ 4 & 2 \end{bmatrix}$

This Matrix is $\boxed{\text{Not Invertible}}$ = No Inverse Exists

Multiplicative Identities:

2 x 2 $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

3 x 3 $\begin{bmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

4 x 4 $\begin{bmatrix} 1 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 \\ 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 1 \end{bmatrix}$

5 x 5 $\begin{bmatrix} 1 & 0 & 0 & 0 & 0 \\ 0 & 1 & 0 & 0 & 0 \\ 0 & 0 & 1 & 0 & 0 \\ 0 & 0 & 0 & 1 & 0 \\ 0 & 0 & 0 & 0 & 1 \end{bmatrix}$

Pre-Calc 2 Assignment 219 Monday, March 16, 2015 Hour Name

NO Calculators - Show your work.

Find the Multiplicative Inverse of each 2 x 2 Matrix.

1. $\begin{bmatrix} 2 & 0 \\ 0 & 3 \end{bmatrix}$

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

3. $\begin{bmatrix} 1 & 2 \\ 3 & 7 \end{bmatrix}$

4. $\begin{bmatrix} -7 & 33 \\ 4 & -19 \end{bmatrix}$

5. $\begin{bmatrix} 5 & 1 \\ -2 & -2 \end{bmatrix}$

6. $\begin{bmatrix} -\frac{1}{4} & -\frac{2}{3} \\ \frac{1}{3} & \frac{8}{9} \end{bmatrix}$

7. $\begin{bmatrix} 2 & 3 \\ -1 & 5 \end{bmatrix}$

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

9. $\begin{bmatrix} -1 & 0 \\ 3 & -2 \end{bmatrix}$

10. $\begin{bmatrix} 2 & -5 \\ 3 & 1 \end{bmatrix}$