Name_____

Algebra 2
Lesson 4-3
Matrix Multiplication

Consider doubling the cost of movie tickets as shown below.

Children	$3.50		Children	$7.00
Adult	$8.50	**doubles to** →	Adult	$17.00
Sr. Citizens	$5.50		Sr. Citizens	$11.00

Mathematically, $2 \times [3.50 \quad 6.25 \quad 5.50\,] = [7.00 \quad 17.00 \quad 11.00]$

Notice that every entry was doubled. In general, multiplying or dividing a matrix by a constant factor is called **scaler** multiplication. The word "scaler" comes from the root word "scale."

Example: Simplify $-3 \times \begin{bmatrix} 3 & -2 & 5 \\ 4 & 0 & -1 \end{bmatrix} = \begin{bmatrix} -9 & 6 & -15 \\ -12 & 0 & 3 \end{bmatrix}$

Matrix multiplication is a bit more complicated. To multiply two matrices the column size of the first matrix must match the row size of the second matrix. In other words:

size of final matrix

Row x Column and Row x Column
***must* match**

To multiply two matrices:

1. Check for a "match" and note the "order;" No match means no multiplication is possible
2. Multiply **first <u>row</u>** of left matrix with **first <u>column</u>** of right matrix. Now sum up all products. Repeat multiplication of **first row** of left matrix with **<u>second</u> column** of right matrix. Sum up products. This will become your first row of the product matrix.
3. Repeat until all **rows** of left matrix have been multiplied with all **<u>columns</u>** of the right matrix.

To multiply matrices with a graphing calculator:

1. Check for "match." remember, no match means no multiplication is possible.
2. Press (2^{nd} x^{-1}) **MATRIX ENTER**>> **EDIT** and then **ENTER.**
3. Input size (row **ENTER** then enter column **ENTER**) of first matrix.
4. Input matrix elements. Press **ENTER** after every entry. **QUIT.**
5. Repeat steps 2, 3, and 4 for second matrix. **QUIT.**
6. Press **MATRX ENTER** x (multiply) v (down) **MATRIX (B) ENTER.**

EXAMPLE: Multiply the matrices

$$\begin{bmatrix} 3 & 2 & 0 \\ -1 & 4 & -2 \end{bmatrix} \quad \begin{bmatrix} 1 & 4 & 0 \\ -2 & 3 & 2 \\ 1 & 0 & -3 \end{bmatrix}$$

Answer: $\begin{bmatrix} -1 & 18 & 4 \\ -11 & 8 & 14 \end{bmatrix}$

Dimensions 2x3 3x3

Dimensions are 2x3