DAY 2 Name: ________________________

MATRICES ON THE CALCULATOR

ADDITION, SUBTRACTION, AND SCALAR MULTIPLICATION:

You can enter and manipulate matrices with your graphing calculator (see directions below):

$$A=\begin{bmatrix}2 & -1\\ 7 & 4\end{bmatrix} \qquad B=\begin{bmatrix}6 & -3\\ 1 & 4\end{bmatrix} \qquad [\mathrm{A}]+[\mathrm{B}]=\begin{bmatrix}8 & -4\\ 8 & 8\end{bmatrix}$$

Entering the Matrix into the Calculator

- Go into the Matrix Menu
  - **2nd** **MATRX** (the x^{-1} key)
    - ► (right arrow) over to **EDIT**
- Select a Matrix
  - **ENTER** for 1:[A] (This is Matrix A) OR
  - Use ▼ (down arrow) to select another Matrix in the list and push **ENTER**
- Input the Dimension (size) of the Matrix (***Rows x Columns***)
  - # of Rows **ENTER**
  - # of Columns **ENTER**
- Input the elements (values) of the Matrix
  - Type in each # so that the matrix in the calculator looks ***exactly*** like the matrix on the paper.
  - Use the arrow keys to move within the Matrix.
- When the Matrix is complete
  - **2nd** **QUIT**

To Perform Operations on Matrices (Addition, Subtraction, Scalar Multiplication)

- Enter all the matrices you need to perform the operation(s).
- Go into the Matrix Menu
  - **2nd** **MATRX** (the x^{-1} key)
    - Under **NAMES**, press **ENTER** for 1:[A] (This is Matrix A) OR
    - Use ▼ (down arrow) to select another Matrix in the list and push **ENTER**
- Name of the first Matrix will appear on the Home screen. Example: [A]
- Push the desired operation key: **+** , **-** , **x** Example: [A] +

- Go into the Matrix Menu
  - **2nd** **MATRX** (the x^{-1} key)
  - Use ▼ to select the other Matrix in the list and push **ENTER**

- Name of second Matrix will appear on the Home screen.   Example: [A] + [B]

- Push **ENTER** and the result will be displayed on the Home screen.

Use your calculator to perform the appropriate operation on the given matrices

$$A=\begin{bmatrix}1&0&4\\6&3&-3\\0&-3&4\end{bmatrix}\; B=\begin{bmatrix}2&7&0\\-4&1&8\\-2&-4&1\end{bmatrix}\; C=\begin{bmatrix}4&0\\-9&2\\1&5\end{bmatrix}\; D=\begin{bmatrix}0&1\\-9&-1\\4&3\end{bmatrix}\; E=\begin{bmatrix}1&0&3\\4&0&-7\\6&4&3\end{bmatrix}$$

1. B + A

$$\begin{bmatrix}2&7&0\\-4&1&8\\-2&-4&1\end{bmatrix}+\begin{bmatrix}1&0&4\\6&3&-3\\0&-3&4\end{bmatrix}=\begin{bmatrix}2+1&7+0&0+4\\-4+6&1+3&8+(-3)\\-2+0&-4+(-3)&1+4\end{bmatrix}=\begin{bmatrix}3&7&4\\2&4&5\\-2&-7&5\end{bmatrix}$$

2. D – C

$$\begin{bmatrix}0&1\\-9&-1\\4&3\end{bmatrix}-\begin{bmatrix}4&0\\-9&2\\1&5\end{bmatrix}=\begin{bmatrix}0-4&1-0\\-9-(-9)&-1-2\\4-1&3-5\end{bmatrix}=\begin{bmatrix}-4&1\\0&-3\\3&-2\end{bmatrix}$$

3. 3E

$$3\begin{bmatrix}1&0&3\\4&0&-7\\6&4&3\end{bmatrix}\begin{bmatrix}3(1)&3(0)&3(3)\\3(4)&3(0)&3(-7)\\3(6)&3(4)&3(3)\end{bmatrix}=\begin{bmatrix}3&0&9\\12&0&-21\\18&12&9\end{bmatrix}$$

4. B + A – C

$$\begin{bmatrix}2&7&0\\-4&1&8\\-2&-4&1\end{bmatrix}+\begin{bmatrix}1&0&4\\6&3&-3\\0&-3&4\end{bmatrix}-\begin{bmatrix}4&0\\-9&2\\1&5\end{bmatrix}=\begin{bmatrix}2+1&7+0&0+4\\-4+6&1+3&8+(-3)\\-2+0&-4+(-3)&1+4\end{bmatrix}-\begin{bmatrix}4&0\\-9&2\\1&5\end{bmatrix}=\begin{bmatrix}3&7&4\\2&4&5\\-2&-7&5\end{bmatrix}-\begin{bmatrix}4&0\\-9&2\\1&5\end{bmatrix}$$

5. 4A – 3E + B

$$4\begin{bmatrix}1&0&4\\6&3&-3\\0&-3&4\end{bmatrix}-3\begin{bmatrix}1&0&3\\4&0&-7\\6&4&3\end{bmatrix}+\begin{bmatrix}2&7&0\\-4&1&8\\-2&-4&1\end{bmatrix}=\begin{bmatrix}4(1)&4(0)&4(4)\\4(6)&4(3)&4(-3)\\4(0)&4(-3)&4(4)\end{bmatrix}+\begin{bmatrix}-3(1)&-3(0)&-3(3)\\-3(4)&-3(0)&-3(-7)\\-3(6)&-3(4)&-3(3)\end{bmatrix}+\begin{bmatrix}2&7&0\\-4&1&8\\-2&-4&1\end{bmatrix}$$

$$=\begin{bmatrix}4&0&16\\24&12&-12\\0&-12&16\end{bmatrix}+\begin{bmatrix}-3&0&-9\\-12&0&21\\-18&-12&-9\end{bmatrix}+\begin{bmatrix}2&7&0\\-4&1&8\\-2&-4&1\end{bmatrix}$$

$$=\begin{bmatrix}4+(-3)+2&0+0+7&16+(-9)+0\\24+(-12)+(-4)&12+0+1&-12+21+8\\0+(-18)+(-2)&-12+(-12)+(-4)&16+(-9)+1\end{bmatrix}$$

$$=\begin{bmatrix}3&7&7\\8&13&17\\-20&-28&8\end{bmatrix}$$

MULTIPLYING MATRICES:

Two matrices can be multiplied only if the number of COLUMNS in the FIRST matrix equals the number of ROWS in the SECOND matrix.

To Multiply Or Not To Multiply

Two matrices can only be multiplied if the number of _________ of A equals the number of ___________ in B.

To Multiply

$$\begin{bmatrix} 8 & -2 \\ 4 & 1 \end{bmatrix} \bullet \begin{bmatrix} 1 & 3 & 5 \\ 0 & 4 & 2 \end{bmatrix} = \begin{bmatrix} 8 & 16 & 36 \\ 4 & 16 & 22 \end{bmatrix}$$

2 X ***2*** * ***2*** X 3 = 2 X 3

Columns = # of Rows Product Matrix

(1st Matrix) (2nd Matrix)

Not To Multiply

$$\begin{bmatrix} 1 & 3 & 5 \\ 0 & 4 & 2 \end{bmatrix} \bullet \begin{bmatrix} 8 & -2 \\ 4 & 1 \end{bmatrix}$$

2 X ***3*** * ***2*** X 2 = NOT POSSIBLE

Columns ≠ # Rows

(1st Matrix) (2nd Matrix)

Notice that the two matrices are the same, but just in a different order. ***This means the order of the matrices is important when multiplying.***

When multiplying matrices you take the row of the 1st matrices times the column of the 2nd matrices. The process is modeled below using 2 matrices which are 2 X 2.

A= $\begin{bmatrix} a & b \\ c & d \end{bmatrix}$ B= $\begin{bmatrix} e & f \\ g & h \end{bmatrix}$

AB= $\begin{bmatrix} ae+bg & af+bh \\ ce+dg & cf+dh \end{bmatrix}$ *note what you are multiplying and adding together.*

Multiply the following matrices together. First check that you can multiply them together. Then **Show ALL of your Work. CIRCLE YOUR FINAL ANSWER!!!!!!**

A= $\begin{bmatrix} x & 3 \end{bmatrix}$ B= $\begin{bmatrix} 4 & -2 \\ 7 & 5 \end{bmatrix}$ C= $\begin{bmatrix} 3 & 9 & -4 \\ 2 & 0 & -1 \end{bmatrix}$ D= $\begin{bmatrix} -5 \\ -8 \\ -4 \end{bmatrix}$ E= $\begin{bmatrix} 7 & 0 & 4 & 8 \end{bmatrix}$ F= $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

1. AB $\begin{bmatrix} x(4)+3(7) & x(-2)+3(5) \end{bmatrix} = \begin{bmatrix} 4x+21 & -2x+15 \end{bmatrix}$

2. CD $\begin{bmatrix} 3(-5)+9(-8)+-4(-4) \\ 2(-5)+0(-8)+-1(-4) \end{bmatrix} = \begin{bmatrix} -15-72+16 \\ -10+0+4 \end{bmatrix} = \begin{bmatrix} -71 \\ -6 \end{bmatrix}$

Multiply the following matrices together. First check that you can multiply them together. Then **Show ALL of your Work. CIRCLE YOUR FINAL ANSWER!!!!!!**

A= $\begin{bmatrix} x & 3 \end{bmatrix}$ B= $\begin{bmatrix} 4 & -2 \\ 7 & 5 \end{bmatrix}$ C= $\begin{bmatrix} 3 & 9 & -4 \\ 2 & 0 & -1 \end{bmatrix}$ D= $\begin{bmatrix} -5 \\ -8 \\ -4 \end{bmatrix}$ E= $\begin{bmatrix} 7 & 0 & 4 & 8 \end{bmatrix}$ F= $\begin{bmatrix} 1 & 0 \\ 0 & 1 \end{bmatrix}$

3. AC $\begin{bmatrix} x(3)+3(2) & x(9)+3(0) & x(-4)+3(-1) \end{bmatrix} = \begin{bmatrix} 3x+6 & 9x+0 & -4x-3 \end{bmatrix} = \begin{bmatrix} 3x+6 & 9x & -4x-3 \end{bmatrix}$

4. DE $\begin{bmatrix} -5(7) & -5(0) & -5(4) & -5(8) \\ -8(7) & -8(0) & -8(4) & -8(8) \\ -4(7) & -4(0) & -4(4) & -4(8) \end{bmatrix} = \begin{bmatrix} -35 & 0 & -20 & -40 \\ -56 & 0 & -32 & -64 \\ -28 & 0 & -16 & -32 \end{bmatrix}$

5. EC E[1 x **4**] · C[**2** x 3] $\longrightarrow$ **$4 \neq 2$** $\longrightarrow$ **Not Possible**

6. AF $\begin{bmatrix} x(1)+3(0) & x(0)+3(1) \end{bmatrix} = \begin{bmatrix} x+0 & 0x+3 \end{bmatrix} = \begin{bmatrix} x & 3 \end{bmatrix}$

7. BF $\begin{bmatrix} 4(1)+-2(0) & 4(0)+-2(1) \\ 7(1)+5(0) & 7(0)+5(1) \end{bmatrix} = \begin{bmatrix} 4+0 & 0-2 \\ 7+0 & 0+5 \end{bmatrix} = \begin{bmatrix} 4 & -2 \\ 7 & 5 \end{bmatrix}$