Homework After Test **Matrix Basics** **Name: ____________________**

First, Read the following Vocabulary and Example Problems on this page.

A **matrix** is a rectangular array of numbers. A matrix can be named by a capital letter. Some examples are shown below.

$$A = \begin{bmatrix} 2 & 4 \end{bmatrix},\ B = \begin{bmatrix} -1 \\ 3 \end{bmatrix},\ C = \begin{bmatrix} -1 & 2 \\ 3 & -2 \end{bmatrix},\ D = \begin{bmatrix} 3 & 5 & 1 \\ -2 & 0 & -1 \end{bmatrix}$$

Row 1

Row 2

Column 1

Column 2

The **dimensions** of a matrix are determined by the number of rows and columns in the matrix. A matrix of dimensions $m \times n$ (read "m by n") has m rows and n columns. Note that the row comes before the column in matrix notation. So, matrix A has dimensions 1×2 and matrix D has dimensions 2×3.

Scalar multiplication is the process of multiplying each entry in a matrix by a **scalar**, a real number.

To **add or subtract matrices** they must have the **same dimensions** (or size).

Adding and Subtracting Matrices

a. $\begin{bmatrix} 2 \\ -1 \\ 7 \end{bmatrix} + \begin{bmatrix} 4 & 0 & -6 \end{bmatrix}$

Since $\begin{bmatrix} 2 \\ -1 \\ 7 \end{bmatrix}$ is a 3×1 matrix and $\begin{bmatrix} 4 & 0 & -6 \end{bmatrix}$ is a 1×3 matrix, you cannot add them.

The sum is called "**Undefined**"

b. Since both matrices are 2×3, you can subtract them.

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

$$= \begin{bmatrix} 2 & 2 & -8 \\ -4 & 2 & 5 \end{bmatrix}$$

Need more Matrix Addition and Subtraction examples? Check out this site
http://www.coolmath.com/algebra/24-matrices/02-adding-subtracting--01

Scalar Multiplication

For the following matrix A, find $2A$

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

I just multiply a 2 on every entry in the matrix:

$$2A = 2 \cdot \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} = \begin{bmatrix} 2\cdot 1 & 2\cdot 2 \\ 2\cdot 3 & 2\cdot 4 \end{bmatrix} = \begin{bmatrix} 2 & 4 \\ 6 & 8 \end{bmatrix}$$

So the final answer is:

$$2A = \begin{bmatrix} 2 & 4 \\ 6 & 8 \end{bmatrix}$$

Need more Scalar Multiplication examples? Check out this site
http://www.coolmath.com/algebra/24-matrices/03-scalar-multiplication-01

Now you try some! Problems on the back! ☺ →

Simplify. Write "undefined" for expressions that are undefined. Show work for credit!

1) $-4\begin{bmatrix} -1 & -5 & 3 \\ -4 & 3 & -6 \end{bmatrix}$

2) $5\begin{bmatrix} -1 & 4 & 3 \\ -4 & -2 & 2 \end{bmatrix}$

3) $\begin{bmatrix} -1 & -1 \\ 5 & 6 \end{bmatrix} + \begin{bmatrix} 6 & -3 \\ 0 & 2 \end{bmatrix}$

4) $\begin{bmatrix} -6 & 2 \\ 4 & -4 \end{bmatrix} - \begin{bmatrix} 4 & -3 \\ -2 & -2 \end{bmatrix}$

5) $\begin{bmatrix} n^2 - 2 \\ m \\ n + m \end{bmatrix} + \begin{bmatrix} -3 \\ -4 \\ -2n \end{bmatrix}$

6) $\begin{bmatrix} -3 & 5 \\ -2 & 1 \\ -4 & -6 \\ 6 & 5 \end{bmatrix} + \begin{bmatrix} 5 \\ 5 \\ 3 \end{bmatrix}$

9) $-5\begin{bmatrix} z & -3z^2 \\ 0 & -3x \\ 4x^2 & z - 4 \end{bmatrix}$

10) $\begin{bmatrix} 5y & y + 5 \\ 2y & 4y - 2 \\ -3 & x - 2 \end{bmatrix} - \begin{bmatrix} x + 3y & 2y^2 \\ 3y & -4x \\ -5xy & x \end{bmatrix}$

Use these matrices to perform the indicated operations, if possible. Show work for credit!
If not possible, write "undefined" and explain why.

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

11. C + D

12. D + E

13. -2C

14. C – E

15. N + E

16. 3N

14. O – N

18. O + C