4.1/4.2 Basic Matrix Algebra
Ly Matrix addition
Ly Scalar Multiplication
Ly Multiplication
Ly Multiplication

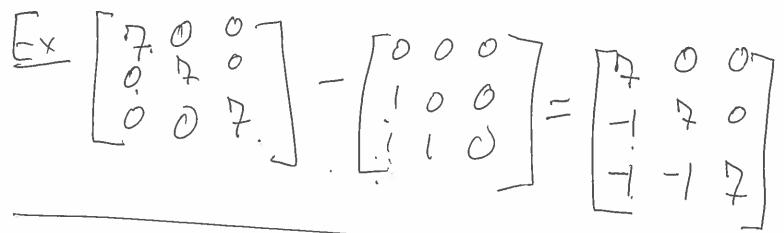
Matrix Addition Given two matrices with same # row and save # took, we add componentwise $Ex \begin{bmatrix} 7 & 2 \\ 3 & 4 \end{bmatrix} + \begin{bmatrix} 8 & 9 \\ 10 & 11 \end{bmatrix} = \begin{bmatrix} 9 & 11 \\ 13 & 15 \end{bmatrix}$ $\begin{bmatrix} 5 \\ 3 \\ 5 \\ 7 \\ 11 \\ 13 \\ 17 \end{bmatrix} + \begin{bmatrix} 19 & 23 & 317 \\ 37 & 43 & 47 \\ 51 & 53 & 59 \end{bmatrix}$ 19 24 33 40 48 54 62 66 76

Scalar Multiplication
$$Ex + \begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix} = \begin{bmatrix} 4 & 8 \\ 12 & 20 \end{bmatrix}$$

$$Ex + \begin{bmatrix} 1 & 2 \\ 3 & 5 \end{bmatrix} = \begin{bmatrix} 4 & 8 \\ 12 & 20 \end{bmatrix}$$

$$= \begin{bmatrix} 7 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix} + \begin{bmatrix} 0 & 0 & 0 \\ 0 & 0 & 1 \\ 1 & 1 & 0 \end{bmatrix}$$

$$= \begin{bmatrix} 7 & 7 & 0 \\ 1 & 1 & 1 \end{bmatrix}$$



Matrix Multiplication

Lo Given M, which is an nxm matrix
Mo which is an problem mx k matrix,

the product M, Mais an nxk matrix.

Note The # ob cols in M, is the Same of the # rows in M2.

1.7 + 2.9 + 3.11 = 58 1.8 + 2.10 + 3.12 = 644.7 + 5.9 + 6.4 = 184139

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

$$-2 & -1$$

$$4 \times 3 \\
-3 & -2 & 2(1) + 0(1) + -1(0) + 3(-2)$$

$$2 \times 3$$

$$-2 \times 3$$

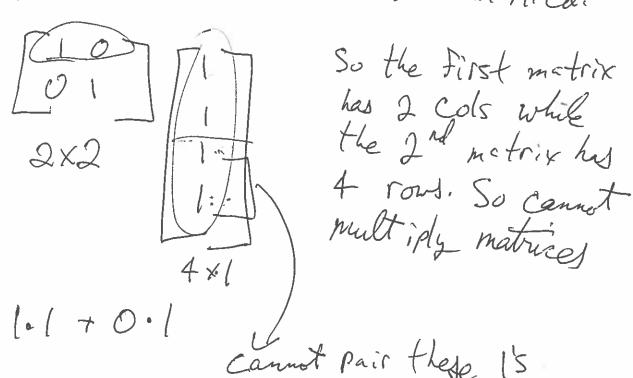
$$-3 \times 3$$

$$-4 \times 3 \times 3$$

$$-4 \times 3 \times 3$$

$$-2 \times 3 \times 3$$

Not all mot rices can be multiplied.



cannot pair these 1's So Cannot multidy.

Ex Matrix Multiplication DOES NOT COMMUTE |

In general, AB + BA when A, B are matrices.

$$A = \begin{pmatrix} 1 & -1 \\ 0 & 2 \end{pmatrix}$$

$$BA = \begin{bmatrix} 3 & -3 \\ 5 & -7 \end{bmatrix}$$

The order in which you multiply matrices matters!