SUMMARY OF SECTION 1.4

MATRIX MULTIPLICATION IS <u>NOT COMMUTATIVE</u> FOR <u>MOST</u> PAIRS OF MATRICES A AND B, $AB \neq BA$.

FOR APPROPRIATE SIZE MATRICES (BOTH SIDES DEFINED) WE HAVE

$$A+B = B+A, \quad A+(B+C) = (A+B)+C, \quad (AB)C = A(BC),$$
$$A(B+C) = AB+AC, \quad (B+C)A = BA+CA, \quad A(B-C) = AB-AC,$$
$$(B-C)A = BA-CA, \quad a(B+C) = aB+aC, \quad a(B-C) = aB-aC,$$
$$(a+b)C = aC+bC, \quad (a-b)C = aC-bC, \quad a(bC) = (ab)C,$$
$$a(BC) = (aB)C = B(aC)$$

A MATRIX WITH ALL ZERO ENTRIES IS CALLED A <u>ZERO MATRIX</u>.

$AB = AC \not\Rightarrow B = C$, CONSIDER $A = \begin{bmatrix} 0 & 1 \\ 0 & 2 \end{bmatrix}$ $B = \begin{bmatrix} 1 & 1 \\ 3 & 4 \end{bmatrix}$ $C = \begin{bmatrix} 2 & 5 \\ 3 & 4 \end{bmatrix}$

$AD = 0 \not\Rightarrow A = 0$ MATRIX OR $B = 0$ MATRIX, USE A ABOVE & $D = \begin{bmatrix} 3 & 7 \\ 0 & 0 \end{bmatrix}$

WE USE "0" TO DENOTE A ZERO MATRIX. WE HAVE THE FOLLOWING

$A+0 = 0+A = A, \quad A-A = 0, \quad 0-A = -A \qquad A0 = 0, \quad 0A = 0$

AN <u>IDENTITY MATRIX</u> IS A SQUARE MATRIX WITH ALL ONES ON THE MAIN DIAGONAL AND ZEROS EVERYWHERE ELSE. IF IT HAS N ROWS AND COLUMNS WE DENOTE IT I_N.

IF A IS $m \times N$, $\quad AI_N = I_m A = A$