${}^tD = D$ if it is a diagonal matrix
${}^tI = I$ if it is an identity matrix
${}^tS = S$ if it is a symmetric matrix
${}^tA = -A$ if it an antisymmetric matrix

MATRIX MULTIPLICATION:

Note: you can not multiply two matrices unless the number of columns of the first matrix is equal as the number of rows of the second one ex: $M_{mxn} * M_{nxf}$

$$\underbrace{\begin{pmatrix} 1 & -2 & 3 \\ 0 & 1 & 4 \\ 2 & -3 & 2 \end{pmatrix}}_{3\times3} . \underbrace{\begin{pmatrix} -1 & 2 \\ 0 & 4 \\ -3 & -5 \end{pmatrix}}_{3\times2}$$

$$= \begin{cases} c_{11} = 1.(-1) + (-2).0 + 3.(-3) \\ c_{21} = 0.(-1) + 1.0 + 4.(-3) \\ c_{31} = 2.(-1) + (-3).0 + 2.(-3) \end{cases}$$

$$c_{12} = 1.(2) + (-2).4 + 3.(-5)$$
$$c_{22} = 0.2 + 1.4 + 4.(-5)$$
$$c_{32} = 2.2 + (-3).4 + 2.(-5)$$

$$= \underbrace{\begin{pmatrix} -10 & -21 \\ -12 & -16 \\ -8 & -18 \end{pmatrix}}_{3\times2} .$$

some of its propreties :

1.the product is not commutative for example A*B ≠ B*A