MAU11002: Mathematics Tutorial Sheet 1 [1]

1. **Matrix Addition**
   Given three 2×2 matrics,

$$A = \begin{pmatrix} 6 & 4 \\ 2 & 5 \end{pmatrix}, \quad B = \begin{pmatrix} 3 & 5 \\ -4 & 1 \end{pmatrix}, \quad C = \begin{pmatrix} 8 & 3 \\ 0 & -3 \end{pmatrix}. \tag{1}$$

   Show by computation, that

   (a) $A + (B + C) = (A + B) + C$

   Compute

   (a) $A - B$
   (b) $B - C$
   (c) $A + C$

2. **Matrix Transpose**
   If A is a matrix, the *transpose* of A is written A^T and it is the matrix obtained by swapping the rows and columns of A. Eg. a matrix,

$$A = \begin{pmatrix} 2 & 3 & 8 \\ 1 & 2 & 5 \end{pmatrix} \tag{2}$$

   has a transpose,

$$A^T = \begin{pmatrix} 2 & 1 \\ 3 & 2 \\ 8 & 5 \end{pmatrix} \tag{3}$$

   Given a matrix

$$B = \begin{pmatrix} -3 & 2 \\ 2 & 4 \\ -1 & 5 \end{pmatrix} \tag{4}$$

   state what size (dimensions) the transpose of B (ie. B^T) will have. Write down B^T.

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3. **Matrix Multiplication**
Given three 2×2 matrics,

$$A = \begin{pmatrix} 6 & 4 \\ 2 & 5 \end{pmatrix}, \quad B = \begin{pmatrix} 3 & 5 \\ -4 & 1 \end{pmatrix}, \quad C = \begin{pmatrix} 8 & 3 \\ 0 & -3 \end{pmatrix}. \tag{5}$$

Show, by computation, that

(a) $AB \neq BA$ (ie. matrix multiplication is *not commutative*)

(b) $A(B + C) = AB + AC$ (ie. matrix multiplication is *distributive* over matrix addition)