

# Matrix\_Problems\_2

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## Matrix transposition

Calculate the transposition of Matrix A

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} \quad A^T = \begin{bmatrix} 1 & 4 \\ 2 & 5 \\ 3 & 6 \end{bmatrix}$$

## Properties of transpose

Properties:

- $(A^T)^T = A$
- $(A + B)^T = A^T + B^T$
- $(AB)^T = B^T A^T$

Given

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix} \quad B = \begin{bmatrix} -1 & 4 \\ 2 & -3 \\ 1 & 0 \end{bmatrix}$$

Calculate:

1)  $(B^T)^T$

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

2)  $(A + B)^T$

**Addition undefined.**

3)  $(AB)^T$

$$AB = \begin{bmatrix} 6 & -2 \\ 12 & 1 \end{bmatrix}$$

$$(AB)^T = \begin{bmatrix} 6 & 12 \\ -2 & 1 \end{bmatrix}$$

## Trace of a Matrix

Given

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

Calculate:

1) Trace(C)

trace  $C = 15$

2) Trace(D)

trace  $D = 3$