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Problem Set 1

1. $$u = \begin{bmatrix} 43 & 41 \\ 99 & 32 \\ 12 & 23 \\ 42 & 14 \end{bmatrix}$$

   Define $u^\top$.

2. Given the scalar $\beta = -12$,

   $$x = \begin{bmatrix} 2 & 6 & 5 & 4 & 3 \end{bmatrix}$$

   Define $x^\top \cdot \beta$.

3. Given the matrix,

   $$x = \begin{bmatrix} 2 & 4 \\ 7 & 9 \end{bmatrix}$$

   Define $x^\top \cdot x$.

4. Given the transposed vector $v^\top_{1\times 4}$

   $$v^\top = \begin{bmatrix} 7 & 8 & 9 & 10 \end{bmatrix}$$

   and vector $u_{4\times 1}$

   $$u = \begin{bmatrix} 7 \\ 8 \\ 9 \\ 10 \end{bmatrix}$$

   find (1) if $v^\top_{1\times 4}$ and $u_{4\times 1}$ are conformable and (2) if the product $u_{4\times 1} \cdot v^\top_{1\times 4}$ exists. If $u_{4\times 1} \cdot v^\top_{1\times 4}$ is defined, find the product.

5. Given vector u

   $$u = \begin{bmatrix} 7 \\ 8 \\ 9 \\ 10 \end{bmatrix}$$

   and vector v

   $$v = \begin{bmatrix} 11 \\ 12 \\ 13 \\ 14 \end{bmatrix}$$

   find (1) the size of each vector, (2) find if the product $v \cdot u$ exists, and (3) find what would be the final size of $v \cdot u$ (if $v \cdot u$ exists). Repeat the same three questions for the relationship $v^\top \cdot u$.

6. Given the matrix,

$$x = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$$

Find $x^\top$. Then (1) define $x^\top \cdot x$ and (2) $x \cdot x^\top$. Is multiplication commutative?

7. Given the matrix,

$$x = \begin{bmatrix} 3 & 4 \\ 5 & 9 \end{bmatrix}$$

Find x^{-1}. To do that, first find the determinant $|x|$, then find the adjoint adj(x). This exercise should be handed in LaTeX.