

Practical part 7: Exercise on linear algebra

1. Let us use the following matrices and vectors:

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

Calculate all of the following expressions, if they are defined. Solve at least a)-d) by hand.

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|------------------------------------|------------------------------------|------------------------------------|------------------------------------|
| a) $2 \cdot \mathbf{A}$ | b) $\mathbf{A} + \mathbf{B}$ | c) $\mathbf{A} \cdot \mathbf{B}^T$ | d) $\mathbf{A} \cdot \mathbf{x}$ |
| e) $\mathbf{A} \cdot \mathbf{B}$ | f) $\mathbf{B}^T \cdot \mathbf{y}$ | g) $\mathbf{A} \cdot \mathbf{A}^T$ | h) $\mathbf{A}^T \cdot \mathbf{A}$ |
| i) $\mathbf{x}^T \cdot \mathbf{x}$ | j) $\mathbf{x} \cdot \mathbf{x}^T$ | | |

R-hints:

- $\mathbf{t}(\mathbf{A})$ corresponds to \mathbf{A}^T
- Make sure you understand the difference between $\mathbf{A}*\mathbf{B}$ and $\mathbf{A} \% \% \mathbf{B}$