1. Matrix operations.

\[ A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}, \quad B = \begin{bmatrix} 4 & 3 & 2 \\ 2 & 3 & 4 \end{bmatrix}, \quad C = \begin{bmatrix} 5 \\ 4 \\ 3 \end{bmatrix}, \quad D = \begin{bmatrix} 9 & 6 & 5 \\ 8 & 4 & 3 \\ 7 & 2 & 1 \end{bmatrix}, \quad E = \begin{bmatrix} 2 & 0 & 0 \\ 0 & 0 & 1 \\ 0 & 1 & 0 \end{bmatrix} \]

What is:

- \( A + 2B \)
- \( (A - B)^T \)
- \( B \cdot B \cdot C \)
- \( C \cdot C^T \)
- \( C^T \cdot C \)
- \( D \cdot A \)
- \( A \cdot D \cdot C \)
- \( D \cdot D^T \)
- \( D + D^T \)
- \( (D + D^T)^T \)
- \( D \cdot D \)
- \( D^T \cdot D \)

2. You can easily manipulate with rows and columns of a matrix by multiplying it with another matrix. You will see how by answering the following questions.

a) Show that multiplying \( D \) from left with \( E \), \( E \cdot D \), transforms matrix \( D \) such that its first row is multiplied by two, and its second and third rows are swapped.

b) How does multiplying \( D \) from right with \( E \), \( D \cdot E \), transform matrix \( D \)?

c) Create matrix \( E \), such that multiplying \( D \) from left with \( E \), \( E \cdot D \), transforms \( D \) such that its second row is divided by 2 and its first and third rows are swapped.

d) Create matrix \( E \), such that multiplying \( D \) from left with \( E \), \( E \cdot D \), transforms \( D \) such that its second row is the original second row minus the original first row of \( D \).