Exercise 1. (**1p**) If possible, solve the following matrix equation for X.

$$\begin{bmatrix} 2 & -1 \\ 1 & 4 \end{bmatrix}^2 + 3X = \begin{bmatrix} 2 & 0 \\ 0 & 2 \end{bmatrix} X + 2 \begin{bmatrix} 2 & -5 \\ 4 & 3 \end{bmatrix}^T$$

Exercise 2. (2p) Let

$$A = \begin{bmatrix} 2 & 2 \\ 0 & 1 \end{bmatrix};\ B = \begin{bmatrix} 1 & 2 \\ 0 & 1 \\ -3 & 0 \end{bmatrix};\quad C = \begin{bmatrix} 1 & 0 & -1 \\ 0 & 2 & -2 \end{bmatrix}$$

a. Which of the following products exist, justify your answer,

$$CA,\quad B^TC,\qquad A + CB,\quad C^2.$$

b. Calculate **one** of them (of the existing ones of course).

Exercise 3. (1p) Let

$$A = \begin{bmatrix} -2 & 1 \\ -1 & 3 \\ 2 & 4 \end{bmatrix};\quad B = [4 \quad -1 \quad 3];\ C = \begin{bmatrix} 5 \\ -2 \\ 4 \end{bmatrix}$$

Calculate $A^T\ (3B^T - 2C)$.