I Let 2016/11/08

$$A = \begin{pmatrix} 1 & -1 & 2 \\ 0 & 3 & 4 \end{pmatrix}, \quad B = \begin{pmatrix} 4 & 0 & -3 \\ -1 & -2 & 3 \end{pmatrix},$$

$$C = \begin{pmatrix} 2 & -3 & 0 & 1 \\ 5 & -1 & -4 & 2 \\ -1 & 0 & 0 & 3 \end{pmatrix}, \quad D = \begin{pmatrix} 2 \\ -1 \\ 3 \end{pmatrix}$$

(i) Find $A+B$ and $3A-4B$

(ii) Find AC, AD, BC, BD

(iii) Find ${}^tA$, $B\,{}^tA$, $D\,{}^tD$, ${}^tD \cdot D$

II Let $e_1 = (1\ 0\ 0)$, $e_2 = (0\ 1\ 0)$, $e_3 = (0\ 0\ 1)$.

Given $A = \begin{pmatrix} a_1 & a_2 & a_3 & a_4 \\ b_1 & b_2 & b_3 & b_4 \\ c_1 & c_2 & c_3 & c_4 \end{pmatrix}$.

Find $e_1 A$, $e_2 A$, $e_3 A$

III Find s and t minimizing

$$\| \vec{c} - s\vec{a} - t\vec{b} \|^2$$

(i) $\vec{a} = \begin{pmatrix} 1 \\ 1 \\ -1 \\ -1 \end{pmatrix}$, $\vec{b} = \begin{pmatrix} 1 \\ 2 \\ 2 \\ 1 \end{pmatrix}$, $\vec{c} = \begin{pmatrix} 0 \\ 0 \\ 0 \\ 1 \end{pmatrix}$

(ii) $\vec{a} = \begin{pmatrix} 1 \\ 1 \\ -1 \\ -1 \end{pmatrix}$, $\vec{b} = \begin{pmatrix} 1 \\ 0 \\ -1 \\ -1 \end{pmatrix}$, $\vec{c} = \begin{pmatrix} 1 \\ 0 \\ 0 \\ 0 \end{pmatrix}$

(iii) $\vec{a} = \begin{pmatrix} 1 \\ 1 \\ -1 \\ -1 \end{pmatrix}$, $\vec{b} = \begin{pmatrix} 1 \\ 0 \\ 2 \\ 1 \end{pmatrix}$, $\vec{c} = \begin{pmatrix} 1 \\ 0 \\ 0 \\ 0 \end{pmatrix}$