①

$$\textcircled{A} = \begin{bmatrix} -1 & 23 & 10 \\ 0 & -2 & -11 \end{bmatrix}$$

a) 2×3

b) not square $\leadsto \underline{\underline{D}}, E, G$

c) not symmetric $\leadsto$

d) X $\longrightarrow$ B

e) B , A

f) F , $\textcircled{E}$ so

g) G $\textcircled{E}$

h) $A^T = \begin{bmatrix} -1 & 0 \\ 23 & -2 \\ 10 & -11 \end{bmatrix}$

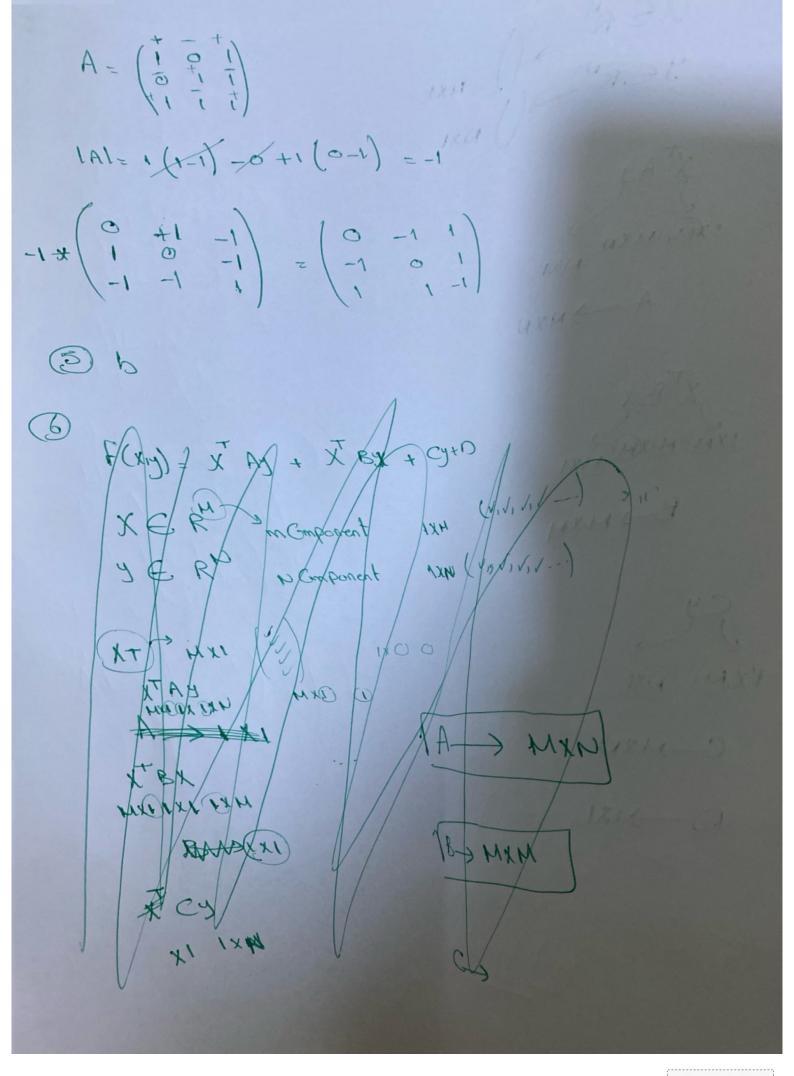$B^T = \begin{bmatrix} -6 & 3 & 5 & 1 \\ 2 & -3 & -11 & -1 \\ 10 & 4 & 9 & 9 \end{bmatrix}$

$1 + 0 + 2$

②

$$A \cdot B = \begin{bmatrix} -1 & 1 & -2 \\ 0 & -2 & 1 \end{bmatrix} \cdot \begin{bmatrix} -1 & 2 & 0 \\ 0 & +3 & 4 \\ -1 & +2 & 3 \end{bmatrix}$$

$$\begin{bmatrix} 3 & -1 & -2 \\ -1 & 4 & -5 \end{bmatrix}$$

$$BC = \begin{bmatrix} -1 & 2 & 0 \\ 0 & -3 & 4 \\ -1 & -2 & 3 \end{bmatrix} \cdot \begin{bmatrix} -3 & 29 & -5 & 7 \end{bmatrix}$$

not possible

③

$$M = \begin{pmatrix} 15 & 10 \\ 3 & 2 \end{pmatrix}$$

~~|M| = 15 × 2 − 30~~

$|M| = 15*2 - 30 = 0$

$$M = \begin{pmatrix} 2 & 3 & 1 \\ -1 & 2 & 3 \\ 3 & 2 & -1 \end{pmatrix}$$

$2(-2-6) - 3(1-9) + 1(-2-6) = -16 + 24 - 8 = 0$

④

$$A = \begin{pmatrix} -3 & -2 \\ 3 & 3 \end{pmatrix}$$

$|A| = (-9+6) = -3$

$A^{-1} = \dfrac{1}{-3}\begin{pmatrix} 3 & 2 \\ -3 & -3 \end{pmatrix} = \begin{pmatrix} -1 & \frac{-2}{3} \\ 1 & 1 \end{pmatrix}$

$$A = \begin{pmatrix} \overset{+}{1} & \overset{-}{0} & \overset{+}{1} \\ 0 & +0 & 1 \\ \overset{+}{1} & -1 & 1 \end{pmatrix}$$

$$|A| = 1(1-1) - 0 + 1(0-1) = -1$$

$$-1 * \begin{pmatrix} 0 & +1 & -1 \\ 1 & 0 & -1 \\ -1 & -1 & 1 \end{pmatrix} = \begin{pmatrix} 0 & -1 & 1 \\ -1 & 0 & 1 \\ 1 & 1 & -1 \end{pmatrix}$$

⑤ b

⑥

$$F(x,y) = X^T A y + X^T B x + C y + 0$$

$X \in R^M$ → m Component $1 \times M$ $(v_1, v_1, v_1, \cdots)$

$Y \in R^N$ → N Component $1 \times N$ $(v_1, v_1, v_1, \cdots)$

X^T → $M \times 1$

$X^T A y$
$M \times M \cdot M \times N$

$A \longrightarrow M \times 1$

$X^T B x$
$M \times 1 \cdot 1 \times 1 \cdot 1 \times M$

$\cdots \times 1$

$C y$
$\times 1$ $1 \times N$

$A \longrightarrow M \times N$

$B \longrightarrow M \times M$

C

$x \in R^M \longrightarrow () ^{MX1}$

$y \in R^N \longrightarrow () ^{NX1}$

$\underbrace{x^T A y}$

$\underset{1XM}{(1XM)} \underset{MXN}{(MXN)} \underset{NX1}{NX1}$

$A \longrightarrow MXN$

$\underbrace{x^T B x}$

$\underset{1XM}{(1XM)} \underset{M XM}{(M XM)} \underset{MX1}{MX1}$

$B \longrightarrow MXM$

$\underbrace{c y}$

$\underset{1XN}{(1XN)} \quad \underset{NX1}{(NX1)}$

$C \longrightarrow 1XN$

$D \longrightarrow 1X1$