Q2 (a)

Don't use a red on my exam

$$\begin{pmatrix} E \\ S \end{pmatrix} = \begin{pmatrix} 4 \\ 18 \end{pmatrix}$$

$$f_D\begin{pmatrix} E \\ S \end{pmatrix} = \begin{pmatrix} 9 & 5 \\ 3 & 14 \end{pmatrix}\begin{pmatrix} 4 \\ 18 \end{pmatrix} \quad \text{mod } 26$$

$$= \begin{pmatrix} 22 \\ 4 \end{pmatrix} = \begin{pmatrix} W \\ E \end{pmatrix}$$

$$\begin{pmatrix} D \\ C \end{pmatrix} = \begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

$$f_D\begin{pmatrix} D \\ C \end{pmatrix} = \begin{pmatrix} 9 & 5 \\ 3 & 14 \end{pmatrix}\begin{pmatrix} 3 \\ 2 \end{pmatrix}$$

$$= \begin{pmatrix} 11 \\ 11 \end{pmatrix} = \begin{pmatrix} L \\ L \end{pmatrix}$$

WELL ← answer

Q2 (b)

$$\left(\begin{array}{ccc|ccc} 1 & 2 & 2 & 1 & 0 & 0 \\ 3 & 2 & 2 & 0 & 1 & 0 \\ 2 & 1 & 2 & 0 & 0 & 1 \end{array}\right) \xrightarrow[R_3 \to R_3 - 2R_1]{R_2 \to R_2 - 3R_1}$$

$$\left(\begin{array}{ccc|ccc} 1 & 2 & 2 & 1 & 0 & 0 \\ 0 & -4 & -4 & -3 & 1 & 0 \\ 0 & -3 & -2 & -2 & 0 & 1 \end{array}\right) \xrightarrow[R_3 \to 4R_3]{R_2 \to -3R_2}$$

$$\left(\begin{array}{ccc|ccc} 1 & 2 & 2 & 1 & 0 & 0 \\ 0 & 12 & 12 & 9 & -3 & 0 \\ 0 & -12 & -8 & -8 & 0 & 4 \end{array}\right) \xrightarrow{R_3 \to R_3 + R_2}$$

$$\left(\begin{array}{ccc|ccc} 1 & 2 & 2 & 1 & 0 & 0 \\ 0 & 12 & 12 & 9 & -3 & 0 \\ 0 & 0 & 4 & 1 & -3 & 4 \end{array}\right) \xrightarrow{R_1 \to 2R_1}$$

$$\left(\begin{array}{ccc|ccc} 2 & 4 & 4 & 2 & 0 & 0 \\ 0 & 12 & 12 & 9 & -3 & 0 \\ 0 & 0 & 4 & 1 & -3 & 4 \end{array}\right) \xrightarrow[R_2 \to R_2 - 3R_3]{R_1 \to R_1 - R_3}$$

$$\left(\begin{array}{ccc|ccc} 2 & 4 & 0 & 1 & 3 & -4 \\ 0 & 12 & 0 & 6 & 6 & -12 \\ 0 & 0 & 4 & 1 & -3 & 4 \end{array}\right) \xrightarrow{R_1 \to R_1 - \frac{1}{3}R_2} \rightarrow$$

$$\left(\begin{array}{ccc|ccc} 2 & 0 & 0 & -1 & 1 & 0 \\ 0 & 12 & 0 & 6 & 6 & -12 \\ 0 & 0 & 4 & 1 & -3 & 4 \end{array}\right)$$

$R_1 \to \frac{1}{2} R_1$

$\longrightarrow$

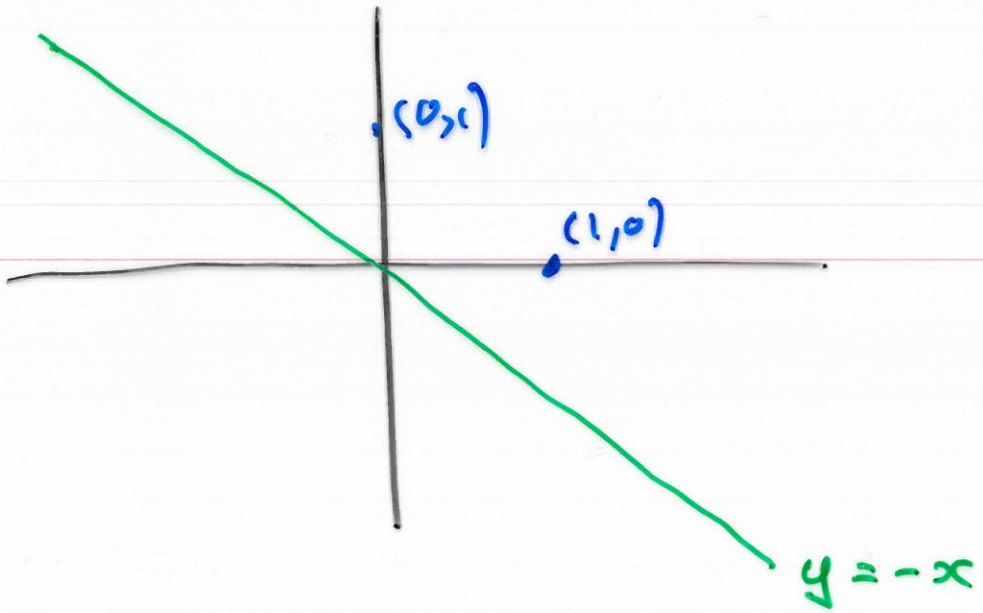
$R_2 \to \frac{1}{12} R_2$

$R_3 \to \frac{1}{4} R_3$

$$\left(\begin{array}{ccc|ccc} 1 & 0 & 0 & -\frac{1}{2} & \frac{1}{2} & 0 \\ 0 & 1 & 0 & \frac{1}{2} & \frac{1}{2} & -1 \\ 0 & 0 & 1 & \frac{1}{4} & -\frac{3}{4} & 1 \end{array}\right)$$

$= A^{-1}$

Q 3 (a)



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

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

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

$$\begin{pmatrix} 0 & \\ 1 & \end{pmatrix} \begin{pmatrix} 1 \\ 0 \end{pmatrix} = \begin{pmatrix} 0 \\ 1 \end{pmatrix}$$

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

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

The matrix of gof is

$$GF = \begin{pmatrix} 0 & -1 \\ 1 & 0 \end{pmatrix}\begin{pmatrix} 0 & -1 \\ -1 & 0 \end{pmatrix} = \begin{pmatrix} 1 & 0 \\ 0 & -1 \end{pmatrix}.$$