Question 2

(e)

$$\begin{vmatrix} 1 & 2 & 1 \\ 2 & 2 & 1 \\ 1 & 2 & 3 \end{vmatrix}$$

$$= 1\begin{vmatrix} 2 & 1 \\ 2 & 3 \end{vmatrix} - 2\begin{vmatrix} 2 & 1 \\ 1 & 3 \end{vmatrix} + 1\begin{vmatrix} 2 & 2 \\ 1 & 2 \end{vmatrix}$$

$$= 1(6-2) - 2(6-1) + 1(4-2)$$

$$= 4 - 10 + 2 = -4$$

Since the determinant of the coefficient matrix is non-zero it follows that the coefficient matrix is nonsingular