Determinants Ex 6.1 Q11

$$\text{Let } A = \begin{vmatrix} x^2 & x & 1 \\ 0 & 2 & 1 \\ 3 & 1 & 4 \end{vmatrix}$$

Expanding the given determinant along the first column

$$|A| = x^2 \begin{vmatrix} 2 & 1 \\ 1 & 4 \end{vmatrix} - 0 \begin{vmatrix} x & 1 \\ 1 & 4 \end{vmatrix} + 3 \begin{vmatrix} x & 1 \\ 2 & 1 \end{vmatrix}$$

$$28 = x^2(8-1) - 0(4x-1) + 3(x-2)$$

$$28 = 7x^2 + 3x - 6$$

or

$$7x^2 + 3x - 6 = 28$$

$$7x^2 + 3x - 34 = 0$$

Solving using quadratic formula, we get x = 2.

Determinants Ex 6.1 Q12(i)

A matrix A is called singular if $|A| = 0$

Now expanding along the first row $|A|$

$$= (x-1)\begin{vmatrix} x-1 & 1 \\ 1 & x-1 \end{vmatrix} - 1\begin{vmatrix} 1 & 1 \\ 1 & x-1 \end{vmatrix} + 1\begin{vmatrix} 1 & 1 \\ x-1 & 1 \end{vmatrix}$$

$$= (x-1)\left[(x-1)^2 - 1\right] - 1[x-1-1] + 1[1-x+1]$$

$$= (x-1)(x^2+1-2x-1) - 1(x-2) + 1(2-x)$$

$$= (x-1)(x^2-2x) - x + 2 + 2 - x$$

$$= (x-1) \times x \times (x-2) + (4-2x)$$

$$= (x-1) \times x \times (x-2) + 2(2-x)$$

$$= (x-1) \times x \times (x-2) - 2(x-2)$$

$$= (x-2)[x(x-1) - 2] \qquad \text{(Taking } (x-2) \text{ common)}$$

Since A is a singular matrix, so $|A| = 0$

$i.e\ (x-2)(x^2-x-2) = 0$

either $(x-2) = 0$ $\qquad$ or $x^2 - x - 2 = 0$

$x = 2$ $\qquad$ or $x^2 - 2x + x - 2 = 0$

$x(x-2) + 1(x-2) = 0$

$(x-2)(x+1) = 0$

$x = 2, -1$

$x = 2$ or -1

Determinants Ex 6.1 Q12(ii)

A matrix A is said to be singular if $|A| = 0$

Now

$$\begin{vmatrix} 1+x & 7 \\ 3-x & 8 \end{vmatrix} = 0$$

$$8 + 8x - 21 + 7x = 0$$

$$15x = 13$$

$$x = \frac{13}{15}$$

*********** END **********