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QUESTION 1

- If the determinant of a matrix is not equal to zero, then the matrix is called a non-singular matrix

- If the determinant of a matrix is equal to zero, then the matrix is called a singular matrix

QUESTION 2

For non-singular matrix

i Matrix $X = \begin{pmatrix} 1 & 2 & 8 \\ 4 & 7 & 6 \\ 9 & 5 & 3 \end{pmatrix}$

$$|X| = 1\begin{vmatrix} 7 & 6 \\ 5 & 3 \end{vmatrix} - 2\begin{vmatrix} 4 & 6 \\ 9 & 3 \end{vmatrix} + 8\begin{vmatrix} 4 & 7 \\ 9 & 5 \end{vmatrix}$$

$$= 1|21-30| - 2|12-54| + 8|20-63|$$

$$= -9 + 84 - 344 = -269$$

$|X| \neq 0$ ∴ Therefore, the matrix is non-singular

ii Matrix $A = \begin{pmatrix} 1 & 2 \\ 3 & 2 \end{pmatrix}$

$$|A| = |3\times2 - 1\times2|$$

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

$|A| \neq 0$ ∴ Therefore, the matrix is non-singular

For singular matrix

i Matrix $X = \begin{pmatrix} 3 & 8 & 1 \\ -4 & 1 & 1 \\ -4 & 1 & 1 \end{pmatrix}$

$$|X| = 3\begin{vmatrix} 1 & 1 \\ 1 & 1 \end{vmatrix} - 8\begin{vmatrix} -4 & 1 \\ -4 & 1 \end{vmatrix} + 1\begin{vmatrix} -4 & 1 \\ -4 & 1 \end{vmatrix}$$

$|X| = 3(1-1) - 8(-4+4) + 1(-4+4) = 0$

$|X| = 0$ ∴ Therefore this is a singular matrix

2. If Matrix $A = \begin{pmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{pmatrix}$

$$|A| = 1\begin{vmatrix} 5 & 6 \\ 8 & 9 \end{vmatrix} - 2\begin{vmatrix} 4 & 6 \\ 7 & 9 \end{vmatrix} + 3\begin{vmatrix} 4 & 5 \\ 7 & 8 \end{vmatrix}$$

$= 1(45-48) - 2(36-42) + 3(32-35)$

$= 1(-3) - 2(-6) + 3(-3)$

$= -3 + 12 - 9 = 0$

$|A| = 0$ ∴ Therefore, this matrix is singular