

1. Find the value of constant λ if the matrix $\begin{bmatrix} \lambda & 1 & 2 \\ 0 & -1 & 5 \\ 2 & 0 & 1 \end{bmatrix}$ is singular

2. For what value of λ , the inverse of matrix $A = \begin{bmatrix} 0 & -4 & 1 \\ 2 & \lambda & -3 \\ 1 & 2 & -1 \end{bmatrix}$ exists.

3. Find rank of the following matrices

(i) $\begin{bmatrix} 1 & 0 & 2 \\ 0 & -2 & 3 \\ 0 & 3 & 0 \\ 0 & 0 & 0 \end{bmatrix}$

(ii) $\begin{bmatrix} 1 & 0 & 2 \\ 0 & 1 & 3 \\ 0 & 0 & 1 \\ 0 & 0 & 0 \end{bmatrix}$

(iii) $\begin{bmatrix} 1 & 0 & 2 \\ 0 & 0 & 3 \\ 0 & 6 & 5 \\ 0 & 0 & 4 \end{bmatrix}$

(iv) $\begin{bmatrix} 1 & 0 & 2 \\ 0 & -2 & 3 \\ 0 & 0 & 0 \\ 0 & 0 & 1 \end{bmatrix}$

4. Let $A = \begin{bmatrix} 2 & -0.1 \\ \dots & \dots \end{bmatrix}$ & $A^{-1} = \begin{bmatrix} \frac{1}{2} & a \\ \dots & \dots \end{bmatrix}$

$\begin{bmatrix} 0 & 0 \end{bmatrix}$
 $\begin{bmatrix} 0 & b \end{bmatrix}$
 then prove that $a+b = \frac{7}{20}$

5. Determine the rank of matrix

(a) $\begin{bmatrix} 1 & 3 & 4 & 3 \\ 3 & 9 & 12 & 9 \\ 1 & 3 & 4 & 1 \end{bmatrix}$
 (b) $\begin{bmatrix} 0 & 2 & 2 \\ 7 & 4 & 8 \\ -7 & 0 & -4 \end{bmatrix}$

6. Under what condition, the rank of the following matrix A is 3?
 Is it possible for the rank to be 1?

$$A = \begin{bmatrix} 2 & 4 & 2 \\ 3 & 1 & 2 \\ 1 & 0 & x \end{bmatrix}$$

7. Find rank of the following matrices

a) $\begin{bmatrix} 4 & -2 & 6 \\ -2 & 1 & -3 \end{bmatrix}$
 b) $\begin{bmatrix} 8 & 0 & 4 & 0 \\ 0 & 2 & 0 & 4 \\ 4 & 0 & 2 & 0 \end{bmatrix}$

c) $\begin{bmatrix} 9 & 0 & 1 & 0 \\ 0 & 0 & 1 & 0 \end{bmatrix}$

$$\begin{bmatrix} 1 & 1 & 1 & 1 \\ 0 & 0 & 1 & 0 \end{bmatrix}$$

8. Find the inverse of the following matrix by applying elementary operations (by Gauss Jordan method)

(a) $\begin{bmatrix} -1 & 2 \\ 2 & 1 \end{bmatrix}$ (b) $\begin{bmatrix} -3 & 4 & 1 \\ 1 & 2 & 0 \\ 1 & 1 & 3 \end{bmatrix}$

(c) $\begin{bmatrix} -2 & 1 & 1 \\ 0 & 1 & 1 \\ -3 & 0 & 6 \end{bmatrix}$ (d) $\begin{bmatrix} 1 & 2 & 3 \\ 3 & 5 & 6 \\ 2 & 4 & 5 \end{bmatrix}$

(e) $\begin{bmatrix} 2 & -1 & 3 \\ 1 & 1 & 1 \\ 1 & -1 & 1 \end{bmatrix}$ $\begin{bmatrix} 0 & 1 & 2 & 2 \\ 1 & 1 & 2 & 3 \\ 2 & 2 & 2 & 3 \\ 2 & 3 & 3 & 3 \end{bmatrix}$

9. Find the condition of k such that the matrix has an inverse. Obtain A^{-1} for $k=1$

$$\begin{bmatrix} 1 & 3 & 4 \\ 3 & k & 6 \\ -1 & 5 & 1 \end{bmatrix}$$

10. Let $A = \begin{bmatrix} 1 & 5 & 4 \\ 0 & 3 & 2 \\ 2 & 3 & 10 \end{bmatrix}$, $B = \begin{bmatrix} 1 & 1 & 1 \\ 2 & 2 & 2 \\ 3 & 3 & 3 \end{bmatrix}$

Find rank of A, rank of B, rank (A+B)
rank (AB) & rank (BA)