Name: Ogbeide Eromosele Jonathan

Department: computer science

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Question

1). Summarize what you understand by singular and non-singular matrices.

2). Give 5 examples to back your explanation in (1) above

Soluton

The [matrices](https://mathinstructor.net/2012/02/starting-with-matrices-order-of-matrix/) are said to be singular if their [determinant](https://mathinstructor.net/2012/03/determinant-of-matrix/) is equal to zero. For example, if we have matrix A whose all elements in the first column are zero. Then, by one of the [property](https://mathinstructor.net/2012/03/properties-of-determinants/) of determinants, we can say that its determinant is equal to zero. Hence, A would be called as singular matrix.

Note that singular matrices are non-invertible (their inverse does not exist).

As, inverse of matrix A= adj (A)/|A|                          ........         (1)

where adj(A) is adjoint of A and |A| is determinant of A.

If, |A|=0 (singular matrix) then inverse of matrix A will not exist according to equation (1)

Similarly, non-singular matrix is a matrix which has non-zero value of its determinant. Non-singular matrices are invertible (their inverse exist).

Example

Example 1: Determine whether the given matrix is a Singular matrix or not

⎡⎣⎢2264086214⎤⎦⎥.

Solution: Given ⎡⎣⎢2264086214⎤⎦⎥

The Determinant is given by-

2(0–16)–4(28–12)+6(16–0)=−2(16)+2(16)=0

the determinant is equal to zero

Therefore the matrix is singular

Example 2: Determine whether the given matrix is a Singular matrix or not

⎡⎣⎢1221-1221-1⎤⎦⎥.

Solution: Given ⎡⎣⎢1221-1221-1⎤⎦⎥

The Determinant is given by-

1(1-2)-2(-1-4)+2(1+2)=1+10+6=15

Therefore, the determinant is not equal to zero

Therefore, the matrix is non singular

Example 2: Determine whether the given matrix is a Singular matrix or not

⎡⎣⎢147258369⎤⎦⎥.

Solution: Given ⎡⎣⎢147258369⎤⎦⎥

The Determinant is given by-

1(45 - 48)-4(18-24)+7(12-13)=-3+24-21=

Therefore, the determinant is equal to zero

Therefore, the matrix is singular

Example 3: Determine whether the given matrix is a Singular matrix or not

⎡⎣⎢241367958⎤⎦⎥.

Solution: Given ⎡⎣⎢241367958⎤⎦⎥

The Determinant is given by-

2(48 -35)-4(24-63)+1(15-54)=145

Therefore, the determinant is not equal to zero

Therefore, the matrix is nonsingular

Example 3: Determine whether the given matrix is a Singular matrix or not

⎡⎣⎢1428⎤⎦⎥.

Solution: Given ⎡⎣⎢1428⎤⎦⎥

The Determinant is given by-

(1)(8)-(2)(4)=0

Therefore, the determinant is equal to zero

Therefore, the matrix is singular

Example 3: Determine whether the given matrix is a Singular matrix or not

⎡⎣⎢2428⎤⎦⎥.

Solution: Given ⎡⎣⎢2428⎤⎦⎥

The Determinant is given by-

2(8)-2(4)=8

Therefore, the determinant is not equal to zero

Therefore, the matrix is nonsingular