Diagonal Matrix

$$D = \begin{bmatrix} d_1 & 0 & 0 \\ 0 & d_2 & 0 \\ 0 & 0 & d_3 \end{bmatrix}$$

* $D^T = D$
* None zero element on its main diagonal

Indentity Matrix

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

- Multiplication identity $AI = IA = A$ for any Matrix A.
- Only square Matrix have an Identity Matrix
- Inverse of Itself : $I^{-1} = I$

Transpose of Matrix

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \end{bmatrix}_{2\times 3}$$

$$A^T = \begin{bmatrix} 1 & 4 \\ 2 & 5 \\ 3 & 6 \end{bmatrix}_{3\times 2}$$

Orthogonal Matrix

$$Q^TQ = QQ^T = I$$

$$Q^{-1} = Q^T$$

$$Q = \begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix} \qquad Q^TQ = \begin{bmatrix} 2 & 5 \\ 3 & 7 \end{bmatrix} \begin{bmatrix} 2 & 3 \\ 5 & 7 \end{bmatrix}$$

$$= \begin{bmatrix} 29 & 41 \\ 41 & 58 \end{bmatrix}$$

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

Since, $Q^TQ = I$, the matrix Q orthogonal.

$B = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix}$

$B^T = \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$

$B \cdot B^T = \begin{bmatrix} 1 & 2 \\ 3 & 4 \end{bmatrix} \times \begin{bmatrix} 1 & 3 \\ 2 & 4 \end{bmatrix}$

$= \begin{bmatrix} 1+4 & 3+8 \\ 3+8 & 9+16 \end{bmatrix}$

$= \begin{bmatrix} 5 & 11 \\ 11 & 21 \end{bmatrix}$

Singular Matrix :

A singular Matrix is a Square matrix whose determine is zero

$\det(A) = 0$

properties

A^{-1} doesn't exist