

Identity and Inverse Matrices

Let us now build on the our matrix definitions¹

Identity matrix

An identity matrix is square, it is also diagonal with 1s on the diagonal.

For example $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix}$ is the 3×3 identity matrix.

The reason why it is called the identity matrix is that the multiplying² any matrix or vector (of suitable dimensions) with the identity matrix simply returns the same matrix or vector.

For example $\begin{pmatrix} 1 & 0 & 0 \\ 0 & 1 & 0 \\ 0 & 0 & 1 \end{pmatrix} \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix} = \begin{pmatrix} 1 \\ 2 \\ 3 \end{pmatrix}$.

An identity matrix is normally denoted I .

Inverse Matrix

The inverse of any matrix A is denoted A^{-1} and it has the property

$$AA^{-1} = A^{-1}A = I$$

Finding the inverse of a 2×2 matrix is straightforward³.

The inverse of a 3×3 matrix can be achieved in a few steps⁴.

The inverse of a larger matrix would be difficult, and normally requires computer software.

¹ [Matrix Definitions](#)

² [Matrix Arithmetic](#)

³ [Inverse of a 2x2 Matrix](#)

⁴ [Inverse of a 3x3 Matrix](#)