

Mathematical Components

Hindol Banerjee

May 27, 2024

1 Representation of Mathematical Components in Latex

1.1 Matrix formation in latex

In LaTeX, matrices are easily created using the 'bmatrix' environment provided by the 'amsmath' package. Each row of the matrix is separated by `\\`, and elements within each row are separated by `&`. You enclose the matrix within `\begin{bmatrix}` and `\end{bmatrix}` tags. Adjustments to the matrix size or style can be made by modifying the code accordingly.

1.1.1 Matrix representation

$$A = \begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & \ddots & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{bmatrix}$$

1.1.2 Representing a 3x3 matrix with actual values

$$A = \begin{bmatrix} 1 & 2 & 3 \\ 4 & 5 & 6 \\ 7 & 8 & 9 \end{bmatrix}$$

1.1.3 Representing Determinants

Let A be a matrix:

$$A = \begin{bmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{bmatrix}$$

The determinant of matrix A , denoted as $|A|$, is calculated as:

$$|A| = \begin{vmatrix} a_{11} & a_{12} \\ a_{21} & a_{22} \end{vmatrix} = a_{11} \cdot a_{22} - a_{12} \cdot a_{21}$$

1.2 Mathematical integrals in latex

1.2.1 Single Integrals

Integral expression can be added using the `\int_{lower}^{\hat{upper}}` command.

$$I = \int_a^b x^2 dx$$

1.2.2 Multiple Integrals

To obtain double/triple/multiple integrals and cyclic integrals you must use 'amsmath' and 'esint' (for cyclic integrals) packages.

$$A = \iint_V \mu(u, v) du dv \tag{1}$$

(2)

$$B = \iiint_V \mu(u, v, w) du dv dw \tag{3}$$

(4)

$$C = \iiint_V \mu(t, u, v, w) dt du dv dw \tag{5}$$

(6)

$$D = \int \cdots \int_V \mu(u_1, \dots, u_k) du_1 \dots du_k \tag{7}$$

1.2.3 Circular Integral

$$I = \oint_V f(s) ds$$

1.3 Fractions and binomials in latex

1.3.1 Representing Fractions

Fractions represent a part of a whole or a division of two numbers:

$$\frac{6}{17}$$

1.3.2 Representation of Binomial coefficient

The binomial coefficient is represented as:

$$\binom{n}{k}$$

1.3.3 Binomial coefficient expression

The binomial coefficient, $\binom{n}{k}$, is defined by the expression:

$$\binom{n}{k} = \frac{n!}{k!(n-k)!}$$