



Sample of MathML 2

Style of Mathematical Expressions

Excerpts from *Chicago Manual of Styles 15th Edition*.

14.22 Mathematical expression and punctuation

Mathematical expressions are sentences or parts of sentences, and they should be punctuated accordingly. Punctuation of displayed expressions requires special attention. In general, if several expressions appear in a single display, they should be separated by commas or semicolons. For example,

$$\begin{aligned}x_1 + x_2 + x_3 &= 3, \\x_1x_2 + x_2x_3 + x_3x_1 &= 6, \\x_1x_2x_3 &= -1.\end{aligned}$$

Consecutive lines of a single multiline expression should not be punctuated:

$$\begin{aligned}(|a + b|)^2 &= (a + b)^2 = a^2 + 2ab + b^2 \\&\leq |a|^2 + 2|a||b| + |b|^2 \\&= |a|^2 + 2|a||b| + |b|^2 \\&= (|a| + |b|)^2.\end{aligned}$$

14.26 Functional notation

In functional notation, nested pairs of parentheses are used instead of brackets or braces to indicate grouping:

$$(f \circ g \circ h)(x) = f(g(h(x))).$$

14.31 Binomial coefficients

The notation $\binom{n}{k}$, "n choose k," is called the binomial coefficient and stands for the number of ways k objects can be chosen from among a collection of n objects.

It is defined by

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

where n and k are positive integers and the notation $!$ stands for the factorial function.

$$n! = n \times (n-1) \times \dots \times 1.$$

14.33 Single vertical bar

A single vertical bar within limits is used to denote the evaluation of a formula at a particular value of one of its variables. For example,

$$\int_0^{\pi/2} \sin x dx = -\cos x \Big|_{x=0}^{x=\pi/2} = 1.$$

14.34 Cases

Displayed mathematical expressions that present a choice between alternatives may be grouped using a single brace and are punctuated as follows:

$$|a| = \{a, a \geq 0; \\ -a, a < 0\}.$$

As a general rule, each alternative is equivalent to a clause in ordinary language and should be punctuated as such. If the alternatives are very long, they may be stated as separate equations:

$$I(t) = Ae^{\Gamma_1(t-t_p)} \{1 + \varepsilon_1 \cos[2\pi f(t-t_p)]\} + B \{1 + \varepsilon_2 \cos[2\pi f(t-t_p)]\}, t \leq t_p, \quad (1a)$$

$$I(t) = Ae^{-\Gamma_2(t-t_p)} \{1 + \varepsilon_1 \cos[2\pi f(t-t_p)]\} + B \{1 + \varepsilon_2 \cos[2\pi f(t-t_p)]\}, t > t_p, \quad (1b)$$

14.49 Matrices

Matrices are arrays of terms displayed in rectangular arrangements of rows and columns and enclosed on the left and right by large brackets or parentheses. Matrices may be written

$$\begin{bmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{bmatrix} \text{ or } \begin{pmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & & \vdots \\ a_{m1} & a_{m2} & \cdots & a_{mn} \end{pmatrix}$$

A matrix consisting of a single row is called a row matrix or a row vector; a matrix consisting of a single column is a column matrix or a column vector. For example,

$$\begin{bmatrix} a & b & c \end{bmatrix} \text{ and } \begin{bmatrix} a \\ b \\ c \end{bmatrix}$$

are row and column matrices.

14.50 Determinants

If A is a square matrix, the determinant of A , denoted $|A|$ or $\det A$, is a function that assigns a specific number to the matrix. If A is an $n \times n$ matrix, the determinant of A is represented by

$$\begin{vmatrix} a_{11} & a_{12} & \cdots & a_{1n} \\ a_{21} & a_{22} & \cdots & a_{2n} \\ \vdots & \vdots & & \vdots \\ a_{n1} & a_{n2} & \cdots & a_{nn} \end{vmatrix}.$$

Vertical bars are used to distinguish the determinant of A from the matrix A . The Jacobian has a reserved notation:

$$J = \left| \frac{\partial(A, B)}{\partial(x, y)} \right|.$$

This is sometimes generalized:

$$J = \left| \frac{\partial(f_1, f_2, \dots, f_n)}{\partial(x_1, x_2, \dots, x_n)} \right|.$$