Sample of MathML 1

Japanese High School Text "Mathematics B"

\( N \)-th power root

In general, a non-zero complex number, \( a = r(\cos \theta + i\sin \theta) \), has the following \( n \) complex numbers as \( n \)-th power roots.

\[
z_n = \sqrt[n]{r} \left\{ \cos \left( \frac{\theta}{n} + \frac{360^\circ}{n} \times k \right) + i \sin \left( \frac{\theta}{n} + \frac{360^\circ}{n} \times k \right) \right\} (k = 0, 1, 2, \ldots, n - 1),
\]

where \( \sqrt[n]{r} \) is a positive \( n \)-th power root of a positive number \( r \).

An angle made by two vectors

Suppose two vectors \( \vec{a} = (a_1, a_2) \) and \( \vec{b} = (b_1, b_2) \) are non-zero vectors, \( \theta \) is the angle made by these two vectors, and \( 0^\circ \leq \theta \leq 180^\circ \). Since \( \vec{a} \cdot \vec{b} = |\vec{a}| |\vec{b}| \cos \theta \),
\[
\cos \theta = \frac{\vec{a} \cdot \vec{b}}{|\vec{a}| |\vec{b}|} = \frac{a_1 b_1 + a_2 b_2}{\sqrt{a_1^2 + a_2^2 b_1^2 + b_2^2}}
\]

A point that divides a segment into \( m:n \)

Suppose two points, \( A(\vec{a}) \) and \( B(\vec{b}) \), are not identical, \( m + n \neq 0 \), and a point, \( P(\vec{p}) \), divides a segment \( AB \) into \( m : n \). Then,

\[
\vec{p} = \frac{n \vec{a} + m \vec{b}}{n + m}
\]

Particularly, when the midpoint of a segment \( AB \) is \( M(\vec{m}) \),

\[
\vec{m} = \frac{\vec{a} + \vec{b}}{2}
\]
Probability distribution

Suppose a random variable $X$ can take the following $n$ values $x_1, x_2, \ldots, x_n$, and the probability of an event $X = x_i$ is $p_i$. Then,

Mean

$$m = E(X) = \sum_{i=1}^{n} x_i p_i$$

Variance

$$V(X) = E((X - m)^2) = \sum_{i=1}^{n} (x_i - m)^2 p_i$$

Standard deviation $\sigma(X) = \sqrt{V(X)}$
Matrix Presentation

\[ A = \begin{pmatrix}
  A_{11} & A_{12} \\
  \vdots & \vdots \\
  A_{21} & A_{22}
\end{pmatrix}
\]