MathML DocBook Examples working with dblatex

COLLABORATORS			
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ACTION	*NAME*	*DATE*	*SIGNATURE*
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Contents

1 This section demonstrates the use of MathML

1.1 Basic MathML: Presentation Markups

$$E = \sqrt{mc^2} \tag{1}$$

$$\frac{E}{F} \tag{2}$$

$$(E + F) \tag{3}$$

$$A = \begin{bmatrix} x & y \\ z & w \end{bmatrix}. \tag{4}$$

$$E = mc^2 \tag{5}$$

$$\sum 4 + x \tag{6}$$

$$(x + y)^2 \tag{7}$$

1.2 Complex MathML: Content Markups

The following examples have been found here: http://www.grigoriev.ru/svgmath

1.2.1 Complex MathML 1

Bernoulli Trials

$$P(E) = \binom{n}{k} p^k (1-p)^{n-k}$$

Cauchy-Schwarz Inequality

$$\left(\sum_{k=1}^{n} a_k b_k\right)^2 \leq \left(\sum_{k=1}^{n} a_k^2\right)\left(\sum_{k=1}^{n} b_k^2\right)$$

Cauchy Formula

$$f(z)\,\Delta Ind_{\gamma}(z) = \frac{1}{2\pi i}\oint_{\gamma} \frac{f(\xi)}{\xi - z}\,d\xi$$

Cross Product

$$V_1 \times V_2 = \begin{vmatrix} i & j & k \\ \frac{\partial X}{\partial u} & \frac{\partial Y}{\partial u} & 0 \\ \frac{\partial X}{\partial v} & \frac{\partial Y}{\partial v} & 0 \end{vmatrix}$$

Vandermonde Determinant

$$\begin{vmatrix} 1 & 1 & \cdots & 1 \\ v_1 & v_2 & \cdots & v_n \\ v_1^2 & v_2^2 & \cdots & v_n^2 \\ \vdots & \vdots & \ddots & \vdots \\ v_1^{n-1} & v_2^{n-1} & \cdots & v_n^{n-1} \end{vmatrix} = \prod_{1 \leq i < j \leq n} (v_j - v_i)$$

Lorenz Equations

$$\begin{aligned} \dot{x} &= \sigma(y-x) \\ \dot{y} &= \rho x - y - xz \\ \dot{z} &= -\beta z + xy \end{aligned}$$

Maxwell's Equations

$$\{ \begin{aligned} \nabla \times \overleftarrow{B} - \tfrac{1}{c}\frac{\partial \overleftarrow{E}}{\partial t} &= \tfrac{4\pi}{c}\overleftarrow{j} \\ \nabla \Delta \overleftarrow{E} &= 4\pi\rho \\ \nabla \times \overleftarrow{E} + \tfrac{1}{c}\frac{\partial \overleftarrow{B}}{\partial t} &= \overleftarrow{0} \\ \nabla \Delta \overleftarrow{B} &= 0 \end{aligned}$$

Einstein Field Equations

$$R_{\mu\nu} - \frac{1}{2} g_{\mu\nu} R = \frac{8\pi G}{c^4} T_{\mu\nu}$$

Ramanujan Identity

$$\frac{1}{(\sqrt{\varphi\sqrt{5}} - \varphi)e^{\frac{25}{\pi}}} = 1 + \frac{e^{-2\pi}}{1 + \frac{e^{-4\pi}}{1 + \frac{e^{-6\pi}}{1 + \frac{e^{-8\pi}}{1 + \ldots}}}}$$

Another Ramanujan identity

$$\sum_{k=1}^{\infty} \frac{1}{2^{\lfloor k\Delta\varphi \rfloor}} = \frac{1}{2^0 + \frac{1}{2^1 + \cdots \frac{1}{2^1 + \frac{1}{2^2 + \cdots \frac{1}{2^3 + \frac{1}{2^5 + \ldots}}}}}}$$

Rogers-Ramanujan Identity

$$1 + \sum_{k=1}^{\infty} \frac{q^{k^2+k}}{(1-q)(1-q^2)\cdots(1-q^k)} = \prod_{j=0}^{\infty} \frac{1}{(1-q^{5j+2})(1-q^{5j+3})}, for |q| < 1.$$

$$\begin{array}{ccc} H & \leftarrow & K \end{array}$$

Commutative Diagram

$$\begin{array}{ccc} \downarrow & & \uparrow \\ H & \rightarrow & K \end{array}$$

1.2.2 Complex MathML 2

Quadratic Equation	$x = \frac{-b\pm\sqrt{b^2-4ac}}{2a}$
DisplayQuadratic Equation	$x = \dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$
Rational Function	$f(x) = \frac{1-x^2}{1-x^3}$
Rational Function	$f(x) = \frac{(1-x^2)x^3}{1-x^3}$
Rational Function	$f(x) = \frac{(1-x^2)(x^3-5x)}{1-x^3}$
Parametrize Rational Function	$f(x) = \frac{(a_i-x^2)^5}{1-x^3}$
Stacked exponents	$g(z) = e^{-x^2}$
Stacked exponents	$g(z) = e^{-(z-a)^2}$
Stacked exponents	$g(z) = e^{-\sum_{i=0}^{\infty} z_i^2}$
Stacked exponents	$g(y) = e^{-\sum_{i=0}^{\infty} y_i^2}$
Stacked exponents	$g(z) = e^{-\sum_{i=0}^{\infty} z^{\frac{2}{a-i}}}$
Cross Product	$\frac{x_1-x_2}{x_3-x_4}\frac{x_1-x_4}{x_2-x_3}$
Cross Product	$(\frac{x_1-x_2}{x_3-x_4})(\frac{x_1-x_4}{x_2-x_3})$
Cross Product	$\left(\frac{x_1-x_2}{x_3-x_4}\right)\left(\frac{x_1-x_4}{x_2-x_3}\right)$
Cross Product	$\frac{(x_1-x_2)(x_3-x_4)}{(x_1-x_4)(x_2-x_3)}$

2 LaTeX

If you are tired of writing equations with MathML, with dblatex you can use the powerful LaTeX equation parser. Here are a few examples.

Note
You have to look at the source code to appreciate how it is easy to write equations with LaTeX.

2.1 Inertial Tensor

For a **c** system of n particles $(n_i)_{i=1\dots n}$, the inertial tensor $\mathscr{I}^c$in relation to the point P is (mathematical notation):

$$\mathscr{I}^c/P = \begin{bmatrix} \mathscr{I}^c_{xx}/P & -\mathscr{I}^c_{xy}/P & -\mathscr{I}^c_{xz}/P \\ -\mathscr{I}^c_{xy}/P & \mathscr{I}^c_{yy}/P & -\mathscr{I}^c_{yz}/P \\ -\mathscr{I}^c_{xz}/P & -\mathscr{I}^c_{yz}/P & \mathscr{I}^c_{zz}/P \end{bmatrix} \tag{8}$$

with:

$$\begin{aligned} \mathscr{I}^c_{xx}/P &= \sum_{i=1}^{n} m_i((y-y_p)_i^2+(z-z_p)_i^2) & \mathscr{I}^c_{yz}/P &= \sum_{i=1}^{n} m_i(y-y_p)_i(z-z_p)_i \\ \mathscr{I}^c_{yy}/P &= \sum_{i=1}^{n} m_i((x-x_p)_i^2+(z-z_p)_i^2) & \mathscr{I}^c_{xz}/P &= \sum_{i=1}^{n} m_i(x-x_p)_i(z-z_p)_i \\ \mathscr{I}^c_{zz}/P &= \sum_{i=1}^{n} m_i((x-x_p)_i^2+(y-y_p)_i^2) & \mathscr{I}^c_{xy}/P &= \sum_{i=1}^{n} m_i(x-x_p)_i(y-y_p)_i \end{aligned}$$

2.2 Change-of-coordinate matrix from body trihedron to element trihedron

Let's define the following trihedron:

- $T_e = (\overrightarrow{x_e}, \overrightarrow{y_e}, \overrightarrow{z_e})$: trihedron for the element '**e**'
- $T_c = (\overrightarrow{x_c}, \overrightarrow{y_c}, \overrightarrow{z_c})$: trihedron for the body '**c**' containing element '**e**'

From the trihedron $T_c = (\overrightarrow{x_c}, \overrightarrow{y_c}, \overrightarrow{z_c})$to the trihedron $T_e = (\overrightarrow{x_e}, \overrightarrow{y_e}, \overrightarrow{z_e})$we use the Euler angles (ψaround $\overrightarrow{x_c}$, θaround $\overrightarrow{y_1}$and φaround $\overrightarrow{x_e}$).

The change-of-coordinate matrix $P^{e\to c}$for a vector of the trihedron $T_e$to the trihedron $T_c$is:

$$P^{e\to c} = \begin{bmatrix} \cos\theta & \sin\theta\sin\varphi & \sin\theta\cos\varphi \\ \sin\theta\sin\psi & \cos\varphi\cos\psi - \cos\theta\sin\varphi\sin\psi & -\sin\varphi\cos\psi - \cos\theta\cos\varphi\sin\psi \\ -\sin\theta\cos\psi & \cos\varphi\sin\psi + \cos\theta\sin\varphi\cos\psi & -\sin\varphi\sin\psi + \cos\theta\cos\varphi\cos\psi \end{bmatrix} \tag{9}$$