Test Suite for the Maxima Plugin   <u>Maxima</u>

All formatted labels on the right margin should be green (pass).

$\text{MaximaControl}\left(\text{"restart"}\right) = \text{"Maxima started successfully."}$

$t_0 := \text{time}(0)$

⊞—Test functions───

Maxima version

$T := \text{Test}\left(\text{M}\left(\text{args}\left(\text{build\_info}(\blacksquare)\right)\right), \begin{pmatrix} \text{"5.40.0"} \\ \text{"2017-06-01 18:54:43"} \\ \text{"x86\_64-w64-mingw32"} \\ \text{"SBCL"} \\ \text{"1.3.15"} \end{pmatrix}\right)$

fail
T

Preset and switch for internal functions

Maxima can directly handle the functions int(), diff(), lim(), det() and sum()

Current default is to let SMath handle all functions.

$T := \text{Test}\left(\dfrac{d}{dx}\,\text{sech}(x),\ -\,\text{sech}(x)\cdot\tanh(x)\right)$

pass
T

$T := \text{STest}\left(\int \sin(x)\,dx,\ \text{"int(sin(x),x)"}\right)$

pass
T

$T := \text{STest}\left(\lim_{x\to\infty}\dfrac{x^2}{x},\ \text{"lim(x,x,∞)"}\right)$

pass
T

$\sum_{j=1}^{n} j = \blacksquare$ $T := \text{SameError}\left(\text{description}(n\_notDefined)\right)$

pass
T

$T := \text{STest}\left(\left\|a\cdot\begin{bmatrix}1 & 2\\ b & 3\end{bmatrix}\right\|,\ \text{"det(a*mat(1,2,b,3,2,2))"}\right)$

pass
T

Alternatives for internal functions

Maxima provides alternatives to the functions int(), diff(), lim(), det() and sum()

$T := \text{Test}\left(\text{Diff}\left(\text{sech}(x)\right),\ -\,\text{sech}(x)\cdot\tanh(x)\right)$

pass
T

$T := \text{Test}\left(\text{Diff}\left(\text{sech}(x),\ x\right),\ -\,\text{sech}(x)\cdot\tanh(x)\right)$

pass
T

$T := \text{Test}\left(\text{Diff}\left(\text{sech}(x),\ x,\ 2\right),\ \left(\tanh(x)-\text{sech}(x)\right)\cdot\left(\tanh(x)+\text{sech}(x)\right)\cdot\text{sech}(x)\right)$

pass
T

$T := \text{Test}\left(\text{Int}\left(\sin(x),\ x\right),\ -\cos(x)\right)$

pass
T

$T := \text{Test}\left(\text{Int}\left(10\,\dfrac{N}{m},\ x,\ 0,\ 2\,m\right),\ 20\,N\right)$

pass
T

$T := \text{STest}\left(\text{Lim}\left(\dfrac{x^2}{x},\ x,\ \infty\right),\ \text{"∞"}\right)$

pass
T

$T := \text{Test}\left(\text{Det}\left(a\cdot\begin{bmatrix}1 & 2\\ b & 3\end{bmatrix}\right),\ a^2\cdot(3-2\cdot b)\right)$

pass
T

$T := \text{Test}\left(\text{Sum}(j,\ j,\ 1,\ n),\ \dfrac{n\cdot(1+n)}{2}\right)$ $\text{Sum}(j, j, 1, n)\ \dfrac{n\cdot(1+n)}{2}$

pass

$$\left(\qquad \qquad \quad 2 \qquad \right) \quad \text{Sum}(j, j, 1, n) = \frac{\qquad}{2} \qquad \qquad \qquad \overline{}$$
T

Wrapping of the internal functions (in order to use their operator representation)

$$\mathbb{ML}\Big(\text{sech}(x)' \Big) = -\text{sech}(x) \cdot \tanh(x)$$

"Received Bytes: 34   Maxima
MaximaLog(∎) = (%i29) diff(sech(x),x,1);
            (%o29) -sech(x)*tanh(x)"

$$\mathbb{ML}\left(\frac{d}{dx}\,\text{sech}(x) \right) = -\text{sech}(x) \cdot \tanh(x)$$

"Received Bytes: 34   SMath
MaximaLog(∎) = (%i30) -sech(x)*tanh(x);
            (%o30) -sech(x)*tanh(x)"

$$\mathbb{ML}\left(\int \sin(x)\,dx \right) = -\cos(x)$$

"Received Bytes: 25   Maxima
MaximaLog(∎) = (%i31) integrate(sin(x),x);
            (%o31) -cos(x)"

$$\mathbb{ML}\left(\int_0^{2\,m} 10\,\frac{N}{m}\,dx \right) = \frac{20\,kg}{s^2}$$

"Received Bytes: 39   SMath, wrong
MaximaLog(∎) = (%i32) (20*%unitkg)/(%units^2);
            (%o32) (20*%unitkg)/%units^2"

$$\mathbb{ML}\left(\int_0^b q\,dx \right) = b \cdot q$$

"Received Bytes: 21   Maxima
MaximaLog(∎) = (%i34) integrate(q,x,0,b);
            (%o34) b*q"

$$\mathbb{ML}\left(\lim_{x \to \infty} \frac{x^2}{x} \right) = \infty$$

"Received Bytes: 21   Maxima
MaximaLog(∎) = (%i35) limit(x,x,inf);
            (%o35) inf"

$$\mathbb{ML}\left(\left| a \cdot \begin{bmatrix} 1 & 2 \\ b & 3 \end{bmatrix} \right| \right) = a^2 \cdot (3 - 2 \cdot b)$$

"Received Bytes: 31
MaximaLog(∎) = (%i36) determinant(a*matrix([1,2],[b,3]));
            (%o36) 3*a^2-2*a^2*b"   Maxima

$$\mathbb{ML}\left(\sum_{j=1}^{n} j \right) = \frac{n \cdot (1 + n)}{2}$$

"Received Bytes: 27
MaximaLog(∎) = (%i37) sum(j,j,1,n);
            (%o37) (n^2+n)/2"

$$T := \text{Test}\left(\mathbb{ML}\left(\sum_{j=1}^{n} j \right), \frac{n \cdot (1 + n)}{2} \right)$$

pass
T

i can't be used as variable in Maxima expressions

$$T := \text{Test}\left(\mathbb{ML}\left(\sum_{i=1}^{n} i \right), \frac{n \cdot (1 + n)}{2} \right)$$

"Received Bytes: 22
MaximaLog(∎) = (%i39) sum(%i,%i,1,n);
            (%o39) %i*n"

fail
T

Ⓢ

"http:/

Test of MaximaTakeover() option "sum()"

MaximaTakeover("sum") = "sum() handled by Maxima"

$$T := \text{Test}\left(\frac{d}{dx}\,\text{sech}(x),\, -\text{sech}(x) \cdot \tanh(x) \right)$$

pass
T

$$T := \text{STest}\left(\int \sin(x)\,dx,\, \text{"int(sin(x),x)"} \right)$$

pass
T

$$T := \text{STest}\left(\lim_{x \to \infty} \frac{x^2}{x},\, \text{"lim(x,x,∞)"} \right)$$

pass
T

$$T := \text{STest}\left(\sum_{j=1}^{n} j,\, \text{"\{n*(1+n)\}/2"} \right)$$

pass
T

$$T := \text{STest}\left(\left\| a \cdot \begin{bmatrix} 1 & 2 \\ b & 3 \end{bmatrix} \right\|,\, \text{"det(a*mat(1,2,b,3,2,2))"} \right)$$

pass

$$\| \begin{bmatrix} b & 3 \end{bmatrix} \|$$) T

Test of MaximaTakeover() option "det()"

$\text{MaximaTakeover}(\texttt{"det()"}) = \texttt{"det() handled by Maxima"}$

$\text{T} := \text{Test}\left(\dfrac{d}{dx}\text{sech}(x) , -\text{sech}(x)\cdot\text{tanh}(x)\right)$ pass T

$\text{T} := \text{STest}\left(\displaystyle\int \sin(x)\, dx , \texttt{"int(sin(x),x)"}\right)$ pass T

$\text{T} := \text{STest}\left(\lim_{x\to\infty}\dfrac{x^2}{x} , \texttt{"lim(x,x,∞)"}\right)$ pass T

$\text{T} := \text{STest}\left(\lim_{x\to\infty}\dfrac{x^2}{x} , \texttt{"lim(x,x,∞)"}\right)$ pass T

$\displaystyle\sum_{j=1}^{n} j = \blacksquare$ $\text{T} := \text{SameError}(\text{description}(n\_\text{notDefined}))$ pass T

$\text{T} := \text{STest}\left(\left\|a\cdot\begin{bmatrix} 1 & 2 \\ b & 3 \end{bmatrix}\right\| , \texttt{"a\^{}2*(3-2*b)"}\right)$ pass T

Test of MaximaTakeover() option "none"

$\text{MaximaTakeover}(\texttt{"none"}) = \texttt{"All functions handled by SMath"}$

$\text{T} := \text{Test}\left(\dfrac{d}{dx}\text{sech}(x) , -\text{sech}(x)\cdot\text{tanh}(x)\right)$ pass T

$\text{T} := \text{STest}\left(\displaystyle\int \sin(x)\, dx , \texttt{"int(sin(x),x)"}\right)$ pass T

$\text{T} := \text{STest}\left(\lim_{x\to\infty}\dfrac{x^2}{x} , \texttt{"lim(x,x,∞)"}\right)$ pass T

$\displaystyle\sum_{j=1}^{n} j = \blacksquare$ $\text{T} := \text{SameError}(\text{description}(n\_\text{notDefined}))$ pass T

$\text{T} := \text{STest}\left(\left\|a\cdot\begin{bmatrix} 1 & 2 \\ b & 3 \end{bmatrix}\right\| , \texttt{"det(a*mat(1,2,b,3,2,2))"}\right)$ pass T

Test of MaximaTakeover() option "all"

$\text{MaximaTakeover}(\texttt{"all"}) = \texttt{"diff(), int(), lim(), sum(), det() handled by Maxima"}$

$\text{T} := \text{Test}\left(\dfrac{d}{dx}\text{sech}(x) , -\text{sech}(x)\cdot\text{tanh}(x)\right)$ pass T

$\text{T} := \text{STest}\left(\displaystyle\int \sin(x)\, dx , \texttt{"-cos(x)"}\right)$ pass T

$\text{T} := \text{STest}\left(\lim_{x\to\infty}\dfrac{x^2}{x} , \texttt{"∞"}\right)$ pass T

$\text{T} := \text{STest}\left(\displaystyle\sum_{j=1}^{n} j , \texttt{"\{n*(1+n)\}/2"}\right)$ pass T

$\text{T} := \text{STest}\left(\left\|a\cdot\begin{bmatrix} 1 & 2 \\ b & 3 \end{bmatrix}\right\| , \texttt{"a\^{}2*(3-2*b)"}\right)$ pass T

Unit handling

$\mathtt{T} := \mathtt{Test}\left(\int_0^{2\,m} 10\,\dfrac{N}{m}\,\mathrm{d}\,x \;,\; 20\,N \right)$ pass   T

$\mathtt{T} := \mathtt{Test}\left(\mathbf{ML}\left(2\,m + 3\,km \right) ,\; 3002\,m \right)$ pass   T

$\mathtt{T} := \mathtt{Test}\left(\mathtt{Solve}\left(a + 3\,m = 500\,cm \;,\; a \right) ,\; \left(a = 2\,m \right) \right)$ pass   T

$x_0 := 10\,mm \qquad y_0 := 50\,mm \qquad \varepsilon_0 := 0.05$

$\varepsilon(x) := \varepsilon_0 \cdot \left(\dfrac{x}{x_0} \right) \qquad y(x) := y_0 \cdot \left(\dfrac{x}{x_0} \right)^2$

$\mathtt{T} := \mathtt{Test}\left(\int_0^{x_0} \varepsilon(x) \cdot \sqrt{1 + \left(\dfrac{\mathrm{d}}{\mathrm{d}\,x}\,y(x) \right)^2}\;\mathrm{d}\,x \;,\; \dfrac{m \cdot \left(-1 + 101^{\frac{3}{2}} \right)}{600000} \right)$ pass   T

Translation tests

$\mathtt{T} := \mathtt{Test}\left(\mathbf{ML}\left(\mathrm{A}\Gamma\Delta\Theta\Lambda\Xi_{\Pi\Sigma\Phi\Psi\Omega} \right) ,\; \mathrm{A}\Gamma\Delta\Theta\Lambda\Xi_{\Pi\Sigma\Phi\Psi\Omega} \right)$ pass   T

$\mathtt{T} := \mathtt{Test}\left(\mathbf{ML}\left(\alpha\beta\gamma\delta\varepsilon\zeta\eta\theta\iota\kappa_{\lambda\mu\nu\xi o\pi\rho\sigma\tau\upsilon\phi\chi\psi\omega} \right) ,\; \alpha\beta\gamma\delta\varepsilon\zeta\eta\theta\iota\kappa_{\lambda\mu\nu\xi o\pi\rho\sigma\tau\upsilon\phi\chi\psi\omega} \right)$ pass   T

$\mathtt{T} := \mathtt{Test}\left(\mathbf{ML}\left(\begin{Bmatrix} \mathtt{"a\ b\backslash\backslash c"} \\ \mathtt{abc} \end{Bmatrix} \right) ,\; \begin{Bmatrix} \mathtt{"a\ b\backslash\backslash c"} \\ \mathtt{abc} \end{Bmatrix} \right)$ pass   T

$\mathtt{T} := \mathtt{Test}\left(\mathbf{ML}\left(\mathtt{"äöüß°"} \right) ,\; \mathtt{"äöüß°"} \right)$ pass   T

$\mathtt{T} := \mathtt{Test}\left(\mathbf{ML}\left(\mathtt{"a+b"} \right) ,\; \mathtt{"a+b"} \right)$ pass   T

$\mathtt{T} := \mathtt{Test}\left(\mathbf{ML}\left(\mathtt{strrep}\left(\mathtt{"a\backslash b"} ,\; \mathtt{"\backslash"} ,\; \mathtt{"/"} \right) \right) ,\; \mathtt{"a/b"} \right)$ pass   T

$\mathtt{T} := \mathtt{Test}\left(\mathbf{ML}\left(\mathtt{"a\backslash b"} \right) ,\; \mathtt{"a\backslash b"} \right)$ pass   T

$\mathtt{T} := \mathtt{Test}\left(\mathbf{ML}\left(\mathtt{"a\backslash\backslash b"} \right) ,\; \mathtt{"a\backslash\backslash b"} \right)$ pass   T

$\mathtt{T} := \mathtt{Test}\left(\mathbf{ML}\left(\mathtt{"\$"a\backslash\backslash b"\$"} \right) ,\; \mathtt{"a\backslash b"} \right)$ pass   T

$\mathtt{T} := \mathtt{Test}\left(\mathbf{ML}\left(a + \mathtt{"\$b\_c\$"} + d \right) ,\; d + b\_c + a \right)$ pass   T

$\mathtt{T} := \mathtt{Test}\left(\mathbf{ML}\left(\mathtt{"\$[x,y]\$"} \right) ,\; \begin{Bmatrix} x \\ y \end{Bmatrix} \right)$ pass   T

$\mathtt{T} := \mathtt{Test}\left(\mathbf{ML}\left(\mathtt{"\$[[x=1,y=2],[x=2,y=3]]\$"} \right) ,\; \begin{Bmatrix} \begin{Bmatrix} x = 1 \\ y = 2 \end{Bmatrix} \\ \begin{Bmatrix} x = 2 \\ y = 3 \end{Bmatrix} \end{Bmatrix} \right)$ pass   T

$\mathtt{T} := \mathtt{Test}\left(\mathbf{ML}\left(\mathtt{"\$2.1e100\$"} \right) ,\; 2.1 \cdot 10^{+100} \right)$ pass   T

$\mathtt{T} := \mathtt{Test}\left(\mathbf{ML}\left(\mathtt{"\$2.1b100\$"} \right) ,\; 2.1 \cdot 10^{100} \right)$ pass   T

$\mathtt{T} := \mathtt{Test}\left(\mathbf{ML}\left(2 \cdot \pi \right) ,\; 2 \cdot \pi \right)$ pass   T

$\mathtt{T} := \mathtt{Test}\left(\mathbf{ML}\left(\sin(i) \right) ,\; i \cdot \sinh(1) \right)$ pass   T

$\mathtt{T} := \mathtt{Test}\left(\mathbf{ML}\left(e^{i} \cdot e^{i} \right) ,\; e^{i} \cdot e^{i} \right)$ pass

T
$T := \text{Test}\left(\text{ML}\left(2.3 \cdot \pi\right),\ 2.3 \cdot \pi\right)$ pass

T
$T := \text{Test}\left(\text{ML}\left(\text{dummy}(a,\ b)\right),\ \text{dummy}(a,\ b)\right)$ pass

T
$T := \text{Test}\left(\text{ML}\left(\begin{bmatrix} 1 & 2 \\ x_y & a \end{bmatrix}\right),\ \begin{bmatrix} 1 & 2 \\ x_y & a \end{bmatrix}\right)$ pass

T
$T := \text{Test}\left(\text{ML}\left(\begin{bmatrix} "1" & 2 \\ x_y & a \end{bmatrix}\right),\ \begin{bmatrix} "1" & 2 \\ x_y & a \end{bmatrix}\right)$ pass

T
$T := \text{Test}\left(\text{ML}\left(v_k\right),\ v_k\right)$ Vector indices   pass

T
$T := \text{Test}\left(\text{ML}\left(M_{jk}\right),\ M_{jk}\right)$ Matrix indizes   pass

T
$T := \text{Test}\left(\text{ML}\left(a \leq b\right),\ a \leq b\right)$ Boolean and relational operators   pass

T
$T := \text{Test}\left(\text{ML}\left(a \geq b\right),\ a \geq b\right)$ pass

T
$T := \text{Test}\left(\text{ML}\left((a \neq b)\right),\ (a \neq b)\right)$ pass

T
$T := \text{Test}\left(\text{ML}\left(a \wedge b\right),\ a \wedge b\right)$ pass

T
$T := \text{Test}\left(\text{ML}\left(a \vee b\right),\ a \vee b\right)$ pass

T
$T := \text{Test}\left(\text{ML}\left(\begin{bmatrix} \{x=1\} & \{x=2\} \\ \{y=2\} & \{y=3\} \end{bmatrix}\right),\ \begin{bmatrix} \{x=1\} & \{x=2\} \\ \{y=2\} & \{y=3\} \end{bmatrix}\right)$ matrices of lists   pass

T
$T := \text{Test}\left(\text{ML}\left(\left\{f\left(\left\{\begin{matrix}a\\b\end{matrix}\right\},\ \left\{\begin{matrix}c\\d\end{matrix}\right\}\right)\right\}\right),\ \left\{f\left(\left\{\begin{matrix}a\\b\end{matrix}\right\},\ \left\{\begin{matrix}c\\d\end{matrix}\right\}\right)\right\}\right)$ Lists and functions with multiple arguments   pass

T
$T := \text{Test}\left(\text{ML}\left(\begin{bmatrix} \{f(x,\ y)\} & 2 \\ "a" & \\ x_y & a \end{bmatrix}\right),\ \begin{bmatrix} \{f(x,\ y)\} & 2 \\ "a" & \\ x_y & a \end{bmatrix}\right)$ Matrices, lists and functions with multiple arguments   pass

T
$c := a \cdot b$

$T := \text{STest}\left(\text{ML}\left(c^2\right),\ \text{"a^2*b^2"}\right)$ pass

T
$T := \text{Test}\left(\text{ML}\left(\text{string}\left(\log_y(x)\right)\right),\ \text{"log(x)/log(y)"}\right)$ pass

T
$T := \text{Test}\left(\text{ML}\left(\text{string}\left(\left\{\begin{matrix}a\\b\end{matrix}\right\}\right)\right),\ \text{"[a,b]"}\right)$ pass

T

Function ODE.2 and handling of Maxima asking questions about signs

pass
$T := \text{Test}\left(\text{ODE}_2\left(\left(\dfrac{d^2}{dt^2}w(t) + \omega^2 \cdot w(t) = 0\right),\ w(t),\ t\right),\ \left\{\begin{matrix}\text{"}\omega\text{ is assumed to be positive."}\\ w(t) = k1 \cdot e^{i \cdot t \cdot \omega} + k2 \cdot e^{-i \cdot t \cdot \omega}\end{matrix}\right\}\right)$
T

pass
$T := \text{Test}\left(\text{ML}\left(\text{assume}(\omega > 0)\right),\ \{(\omega > 0)\}\right)$
T

pass
$T := \text{Test}\left(\text{Assign}\left(\text{ODE}_2\left(\left(\dfrac{d^2}{dt^2}w(t) + \omega^2 \cdot w(t) = 0\right),\ w(t),\ t\right)\right),\ k1 \cdot \sin(t \cdot \omega) + k2 \cdot \cos(t \cdot \omega)\right)$
T

Functions Solve(), Algsys(), LinSolve() and Assign()

pass
$T := \text{Test}\left(\text{Assign}\left(\text{Solve}\left(\left|\begin{matrix}x^2 + (3 \cdot x) \cdot y + y^2 = 0\\ 2 \cdot x + y = 1\end{matrix}\right|,\ \begin{bmatrix}x\\y\end{bmatrix}\right)\right),\ \left\{\begin{matrix}\dfrac{-3+\sqrt{5}}{2}\\ -7+3\cdot\sqrt{5}\end{matrix}\right\}\right.$ $\text{Clear}(x,\ y) = 1$
T

$$3 \cdot x + y = 1 \qquad \left| \cdot \cdot \right\rangle\right)_1 \quad \left[\frac{\cdots}{2}\right]$$

$$T := \text{Test}\left(\text{Solve}\left(\begin{cases} a_1 + a_2 = 0 \\ a_1 - a_2 = 1 \end{cases}, \begin{cases} a_1 \\ a_2 \end{cases}\right), \begin{cases} a_1 = \frac{1}{2} \\ a_2 = -\frac{1}{2} \end{cases}\right)$$

fail

T

"Received Bytes: 42
MaximaLog(∎) = (%i96) solve([el(a,1)+el(a,2)=0,el(a,1)-el(a,2)=1],[el(a,1),el(a,2)]);
(%o96) [[a[1] = 1/2,a[2] = -1/2]]"

$$eq_1 := \left(x^2 + (3 \cdot x) \cdot y + y^2 = 0\right) \quad eq_2 := (3 \cdot x + y = 1)$$

$$T := \text{Test}\left(\text{Algsys}\left(\begin{bmatrix} eq_1 \\ eq_2 \end{bmatrix}, \begin{bmatrix} x \\ y \end{bmatrix}\right), \begin{bmatrix} \left\{\begin{matrix} x = -\frac{-3+\sqrt{5}}{2} \\ y = \frac{-7+3\cdot\sqrt{5}}{2} \end{matrix}\right\} & \left\{\begin{matrix} x = \frac{3+\sqrt{5}}{2} \\ y = \left(-\frac{7+3\cdot\sqrt{5}}{2}\right) \end{matrix}\right\} \end{bmatrix}\right)$$

pass

T

$$eq_1 := (x + z = y) \quad eq_2 := \left((2 \cdot a) \cdot x - y = 2 \cdot a^2\right) \quad eq_3 := (y - (2 \cdot z) = 2)$$

$$T := \text{Test}\left(\text{Unknowns}(eq), \begin{bmatrix} a \\ x \\ y \\ z \end{bmatrix}\right)$$

pass

T

$$T := \text{Test}\left(\text{LinSolve}\left(eq, \begin{cases} x \\ y \\ z \end{cases}\right), \begin{cases} (x = (1 + a)) \\ (y = 2 \cdot a) \\ (z = (-1 + a)) \end{cases}\right)$$

pass

T

Cross product with scaled vectors

$$a := \begin{bmatrix} a_1 \\ a_2 \\ a_3 \end{bmatrix} \quad b := \begin{bmatrix} b_1 \\ b_2 \\ b_3 \end{bmatrix} \quad c := \begin{bmatrix} c_1 \\ c_2 \\ c_3 \end{bmatrix} \quad \overrightarrow{(\lambda \cdot a)} \times b = \begin{bmatrix} \lambda \cdot (a_2 \cdot b_3 - a_3 \cdot b_2) \\ \lambda \cdot (a_3 \cdot b_1 - a_1 \cdot b_3) \\ \lambda \cdot (a_1 \cdot b_2 - a_2 \cdot b_1) \end{bmatrix}$$

$$T := \text{Test}\left(\mathbf{M}\left((\lambda \cdot a) \times b\right), \begin{bmatrix} a_2 \cdot b_3 - a_3 \cdot b_2 \\ a_3 \cdot b_1 - a_1 \cdot b_3 \\ a_1 \cdot b_2 - a_2 \cdot b_1 \end{bmatrix} \cdot \lambda\right) \qquad (\lambda \cdot a) \times b = \blacksquare$$

pass

T

$$a \cdot (b \times c) = a_1 \cdot (b_2 \cdot c_3 - b_3 \cdot c_2) + a_2 \cdot (b_3 \cdot c_1 - b_1 \cdot c_3) + a_3 \cdot (b_1 \cdot c_2 - b_2 \cdot c_1)$$

$$T := \text{Test}\left(\mathbf{M}(a \cdot (b \times c)), a_1 \cdot (b_2 \cdot c_3 - b_3 \cdot c_2) + a_2 \cdot (b_3 \cdot c_1 - b_1 \cdot c_3) + a_3 \cdot (b_1 \cdot c_2 - b_2 \cdot c_1)\right)$$

pass

T

$$a \cdot \overrightarrow{(\lambda \cdot b \times c)} = \lambda \cdot \left((b_2 \cdot c_3 - b_3 \cdot c_2) \cdot a_1 + (b_3 \cdot c_1 - b_1 \cdot c_3) \cdot a_2 + (b_1 \cdot c_2 - b_2 \cdot c_1) \cdot a_3\right)$$

$$\mathbf{M}\left(a \cdot \overrightarrow{(\lambda \cdot b \times c)}\right) = \left(a_1 \cdot (b_2 \cdot c_3 - b_3 \cdot c_2) + a_2 \cdot (b_3 \cdot c_1 - b_1 \cdot c_3) + a_3 \cdot (b_1 \cdot c_2 - b_2 \cdot c_1)\right) \cdot \lambda$$

"Received Bytes: 118
MaximaLog(∎) = (%i103) λ*((b_%_2*c_%_3-b_%_3*c_%_2)*a_%_1+(b_%_3*c_%_1-b_%_1*c_%_3)*a_%_
(%o103) (a_%_1*(b_%_2*c_%_3-b_%_3*c_%_2)+a_%_2*(b_%_3*c_%_1-b_%_1*c_%_3)+

$$M := \mathbf{M}\left(a \cdot \overrightarrow{(\lambda \cdot b \times c)}\right) = \blacksquare$$

$$T := \text{Test}\left(M, \lambda \cdot \left((b_2 \cdot c_3 - b_3 \cdot c_2) \cdot a_1 + (b_3 \cdot c_1 - b_1 \cdot c_3) \cdot a_2 + (b_1 \cdot c_2 - b_2 \cdot c_1) \cdot a_3\right)\right)$$

pass

T

"Received Bytes: 138
MaximaLog(∎) = (%i104) matrix([a_%_1],[a_%_2],[a_%_3])*vectorize(λ*matrix([b_%_1],[b_%_2
(%o104) matrix([-a_%_1],[-a_%_2],[-a_%_3])*matrix([c_%_1],[c_%_2],[c_%_3]

$\text{Clear}(a, b, c) = 1$

Handling of warnings and messages

$T := \text{Test}\left(\text{Solve}\left(\cos(x) = \dfrac{1}{\sqrt{2}}, x\right)_2, \left(x = \dfrac{\pi}{4}\right)\right)$

T

$T := \text{Test}\left(\displaystyle\int_{-1}^{1} \dfrac{|x-1|}{x}\, dx, \left(\left\{\begin{matrix}"\text{Principal Value}"\\ -2\end{matrix}\right.\right)\right)$

T

$T := \text{Test}\left(\mathbf{M}\left(\text{ilt}\left(\dfrac{(2\cdot(s-a))\cdot(s+a)}{s^3\cdot(b\cdot s^2 + a\cdot(1-(a\cdot b)))}, s, t\right)\right), \left\{\begin{matrix}"a*b*(a*b-1) \text{ is assumed to be positive."}\\ -2\cdot\dfrac{\cosh\left(\sqrt{a\cdot b\cdot(a\cdot b - 1)}\cdot\dfrac{t}{b}\right)}{\left(a^3\cdot b^2 - 2\cdot a^2\cdot b + a\right)} + a\cdot\dfrac{t^2}{(a\cdot b - 1)} + \dfrac{}{\left(a^3\cdot b^2 - \right.}\end{matrix}\right.\right.$

T

Back-translation of at()

$T := \text{Test}\left(\mathbf{M}\left(\text{laplace}\left(\dfrac{d^2}{dt^2}\text{delta}(t), t, s\right)\right), \left.-\dfrac{d}{dt}\text{delta}(t)\right|_{t=0} + s^2 - \text{delta}(0)\cdot s\right)$

T

Plotting with plot2d

$p :=$
$\mathbf{M}\left(\text{set\_plot\_option}\left(\begin{matrix}\text{gnuplot\_preamble}\\ "\text{set key bottom right; set grid}"\end{matrix}\right)\right)$
$\mathbf{M}\left(\text{set\_plot\_option}\left(\begin{matrix}\text{gnuplot\_term}\\ "\text{png small size 250, 200}"\end{matrix}\right)\right)$
$\mathbf{M}\left(\text{plot2d}\left(\begin{pmatrix}\text{asin}(x)\\ \text{acos}(x)\\ \text{asinh}(x)\\ \text{atanh}(x)\end{pmatrix}, \begin{Bmatrix}x\\ -\pi\\ \pi\end{Bmatrix}\right)\right)$
$\text{concat}\left(\mathbf{M}(\text{maxima\_tempdir}), "/", "\text{maxplot.png}"\right)$

$\text{CurrentDirectory}(\text{DocumentDirectory}(\blacksquare)) = "\text{C:\textbackslash FHB\textbackslash Software\textbackslash SMath\textbackslash Activebook\textbackslash activebook\textbackslash}"$
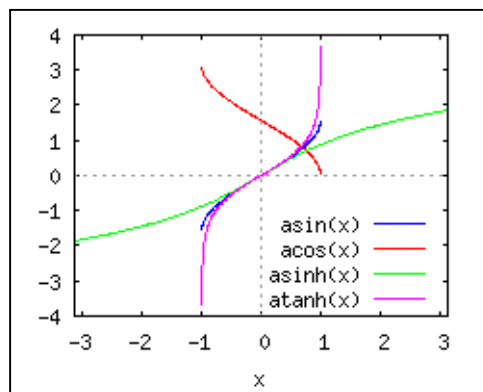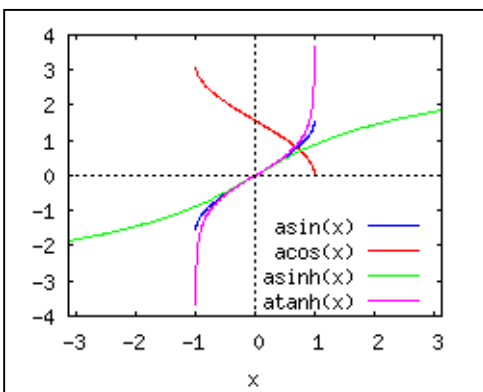
p

"maxplotref.png"

Draw2D() with special characters and automatic temporary filename

$\text{cmd} := \left\{\begin{matrix}\text{title} = "\text{Grüne\^2 Kurve\_1 auf Weiß bei 20°C}"\\ \text{color} = \text{green}\\ \text{explicit}(\sin(x), x, -\pi, \pi)\\ \text{grid} = \text{true}\end{matrix}\right.$

Maxima> Draw 2D() region, format png

Maxima draw error:
error("[Maxima]: No data available")

Image region

Grüne^2 Kurve$_1$ auf Weiß bei 20°C

cmd

$$\text{Draw2D}\left(\text{cmd} , \begin{Bmatrix} 300 \\ 150 \end{Bmatrix}\right)$$

Maxima> Draw 2D() region, format svg

Image region

Maxima draw error:
error("[Maxima]: No data available")

cmd

$$\text{Draw2D}\left(\text{cmd} , \texttt{"gruen.svg"} , \begin{Bmatrix} 300 \\ 150 \end{Bmatrix}\right)$$
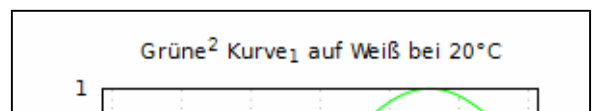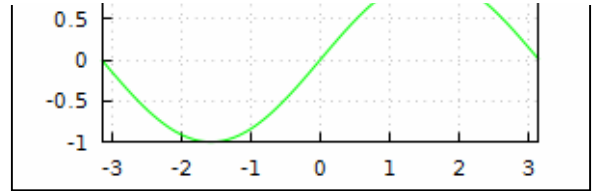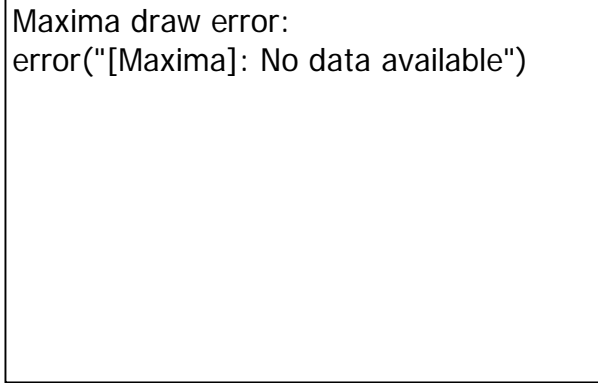
In the Draw region, svg terminal is
noenhanced (for correct alignment)
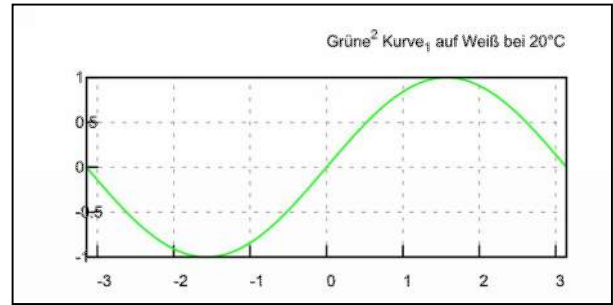
In the Draw2D() function, svg terminal is
enhanced (for full feature images, they
display correctly in inkscape

Result format of Eigenvalues and -vectors

$$T := \text{Test}\left(\text{ℳ}\left(\text{eigenvectors}\begin{bmatrix} 100 & 50 \\ 50 & 0 \end{bmatrix}\right) , \left[\left[50 - 25\cdot 2^{\left(\frac{3}{2}\right)} \quad 25\cdot 2^{\left(\frac{3}{2}\right)} + 50\right] \begin{bmatrix} \begin{bmatrix} 1 & -\sqrt{2} & -1 \end{bmatrix} \\ \begin{bmatrix} 1 & \sqrt{2} & -1 \end{bmatrix} \end{bmatrix}\right]\right)$$

pass
T

$$T := \text{Test}\left(\text{ℳ}\left(\text{eigenvectors}\begin{bmatrix} 1\,m & 0 & 0 \\ 0 & 3 & 0 \\ 0 & 0 & 1\,m \end{bmatrix}\right) , \left[\begin{bmatrix} 1\,m & 3 \\ 2 & 1 \end{bmatrix} \begin{bmatrix} \begin{bmatrix} 1 & 0 & 0 \end{bmatrix} \\ \begin{bmatrix} 0 & 0 & 1 \end{bmatrix} \\ \begin{bmatrix} 0 & 1 & 0 \end{bmatrix} \end{bmatrix}\right]\right)$$

pass
T

Translation of derivatives improved

diff(3) is used only if exponent is greater than 1

$$T := \text{STest}\left(\frac{d}{dx}\frac{d}{dy} f(x, y) , \texttt{"diff(diff(f(x,y),y),x)"}\right)$$

pass
T

$$T := \text{STest}\left(\frac{d^2}{dx^2} f(x, y) , \texttt{"diff(f(x,y),x,2)"}\right)$$

fail
T

$$T := \text{STest}\left(\text{Diff}(f(x) , x , 2) , \texttt{"diff(f(x,y),x,2)"}\right)$$

fail
T

$$T := \text{STest}\left(\frac{d}{dx}\frac{d}{dy}\frac{d}{dz} f(x, y, z) , \texttt{"diff(diff(diff(f(x,y,z),z),y),x)"}\right)$$

pass
T

$$T := \text{Test}\left(\text{ℳ}\left(\text{jacobian}\left(\begin{Bmatrix} f(r, \varphi) \\ g(r, \varphi) \end{Bmatrix} , \begin{Bmatrix} r \\ \varphi \end{Bmatrix}\right)\right) , \begin{bmatrix} \frac{d}{dr} f(r, \varphi) & \frac{d}{d\varphi} f(r, \varphi) \\ \frac{d}{dr} g(r, \varphi) & \frac{d}{d\varphi} g(r, \varphi) \end{bmatrix}\right)$$

pass
T

Test of diff(1)

$$T := \text{Test}\left((f(x)\cdot g(x))' , f(x)\cdot\frac{d}{dx} g(x) + g(x)\cdot\frac{d}{dx} f(x)\right)$$

pass
T

$\text{T} := \text{Test}\left(\left(\sin(x) \cdot \ln(x) \right)' , \ \frac{\sin(x)}{x} + \cos(x) \cdot \ln(x) \right)$ `pass` T

$\text{T} := \text{Test}\left(\left(f(g(x)) \right)' , \ \frac{d}{dx} f(g(x)) \right)$ `pass` T

$\text{T} := \text{Test}\left(\left(\sin\left(x^2\right) \right)' , \ 2 \cdot x \cdot \cos\left(x^2\right) \right)$ `pass` T

Function calls

$f(a) := a^2$

$\text{T} := \text{Test}\left(\text{M}\left(f(b \ mm) \right) , \ m^2 \cdot \frac{b^2}{1000000} \right)$ `pass` T

$\text{T} := \text{Test}\left(\text{M}\left(f((b \ mm)) \right) , \ m^2 \cdot \frac{b^2}{1000000} \right)$ `pass` T

$\text{T} := \text{Test}\left(\text{M}\left(a\_b\_c\_d \right) , \ a\_b\_c\_d \right)$ `pass` T

$\text{T} := \text{Test}\left(\text{M}\left(\text{string}(a\_b\_c\_d) \right) , \ \texttt{"a\_b\_c\_d"} \right)$ `pass` T

$\text{T} := \text{Test}\left(\text{M}\left(a_{b.c.d} \right) , \ a_{b.c.d} \right)$ `pass` T

$\text{T} := \text{Test}\left(\text{M}\left(\text{string}\left(a_{b.c.d}\right) \right) , \ \texttt{"a\_\%\_b\_\%\_c\_\%\_d"} \right)$ `pass` T

$\text{T} := \text{Test}\left(\text{M}\left(a_{b.c} \right) , \ a_{b.c} \right)$ `pass` T

$\text{T} := \text{Test}\left(\text{M}\left(\text{string}\left(a_{b.c}\right) \right) , \ \texttt{"a\_\%\_b\_\%\_c"} \right)$ `pass` T

$\text{T} := \text{Test}\left(\text{M}\left(\begin{Bmatrix} 1.2 \\ 2.3 \end{Bmatrix} \right) , \ \begin{Bmatrix} 1.2 \\ 2.3 \end{Bmatrix} \right)$ `pass` T

$\text{T} := \text{Test}\left(\text{M}\left(f\left(a\# , \ \#b_{c\#}\right) \right) , \ f\left(a\# , \ \#b_{c\#}\right) \right)$ `pass` T

Loading of abs_integrate

$f(x) := x^3 - \left(6 \cdot x^2\right) + 8 \cdot x$

$\text{T} := \text{Test}\left(\int_0^3 |f(x)| \, dx , \ \frac{23}{4} \right)$ `pass` T

Definition in SMath and Maxima

$\text{T} := \text{Test}\left(\text{MaximaDefine}(A , 3) , \ 3 \right)$ `pass` T

$\text{T} := \text{Test}(A , A)$ Variable A wird in SMath nicht definiert.   `pass` T

$\text{T} := \text{Test}\left(\text{M}\left(\texttt{"\$A\$"} \right) , \ 3 \right)$ `pass` T

Transfer of an existing SMath-Definition to Maxima

$C := \begin{Bmatrix} 2 \\ 3 \end{Bmatrix}$ $D := 4$ Definition in SMath

$\text{T} := \text{Test}\left(\text{MaximaDefine}(C) , \ \begin{Bmatrix} 2 \\ 3 \end{Bmatrix} \right)$ `pass` T

$\text{T} := \text{Test}\left(\text{MaximaDefine}(D) , \ 4 \right)$

$\text{Clear}(D , C) = 1$ Clear the definition in SMath

$T := STest\left(D \cdot C \,,\, \texttt{"D*C"}\right)$ pass   T

$T := Test\left(\boxed{ML}\left(D \cdot C\right) \,,\, \begin{Bmatrix} 8 \\ 12 \end{Bmatrix}\right)$ Still available in Maxima   pass   T

$T := Test\left(\boxed{ML}\left(kill\left(D \,,\, C\right)\right) \,,\, done\right)$ Clear the definitions in Maxima   pass   T

$T := Test\left(\boxed{ML}\left(D \cdot C\right) \,,\, C \cdot D\right)$ pass   T

$T := Test\left(MaximaDefine\left(fpprec \,,\, 40\right) \,,\, 40\right)$ pass   T

$T := Test\left(\boxed{ML}\left(bfloat\left(\pi\right)\right) \,,\, 3.1415926535897932384626433832795028841971 \cdot 10^{0}\right)$ pass   T

$T := Test\left(MaximaDefine\left(fpprec \,,\, 16\right) \,,\, 16\right)$ pass   T

$T := Test\left(\boxed{ML}\left(bfloat\left(\pi\right)\right) \,,\, 3.141592653589793 \cdot 10^{0}\right)$ pass   T

$T := Test\left(\boxed{ML}\left(split\left(\texttt{"a,b"} \,,\, \texttt{","}\right)\right) \,,\, \begin{Bmatrix} \texttt{"a"} \\ \texttt{"b"} \end{Bmatrix}\right)$ pass   T

$T := Test\left(\boxed{ML}\left(\texttt{"\$at(diff(delta(y),y),y=0)\$"}\right) \,,\, \left.\frac{d}{dy} delta\left(y\right)\right|_{y=0}\right)$ pass   T

$T := Test\left(\boxed{ML}\left(\left.\frac{d}{dy} delta\left(y\right)\right|_{y=0}\right) \,,\, \left.\frac{d}{dy} delta\left(y\right)\right|_{y=0}\right)$ pass   T

$T := Test\left(\boxed{ML}\left(x^{0.5}\right) \,,\, x^{0.5}\right)$ pass   T

$T := Test\left(\boxed{ML}\left(\%\right) \,,\, x^{0.5}\right)$ pass   T

Access to Lapack functions

$msg := \boxed{ML}\left(load\left(lapack\right)\right)$

$M := \begin{bmatrix} 1 & 2 & 3 \\ 3.5 & 0.5 & 8 \\ -1 & 2 & -3 \\ 4 & 9 & 7 \end{bmatrix}$ $T := Test\left(\boxed{ML}\left(dgesvd\left(M \,,\, true \,,\, true\right)\right)_1 \,,\, \begin{Bmatrix} 14.47444340493696 \\ 6.386367492469741 \\ 0.452546537278426 \end{Bmatrix}\right)$ pass   T

$T := Test\left(\boxed{ML}\left(laplace\left(\sum_{n=0}^{\infty}\left(\left(-1\right)^{n} \cdot unit\_step\left(t - n \cdot \pi\right) \cdot \sin\left(t\right)\right) \,,\, t \,,\, s\right)\right) \,,\, \frac{e^{\pi \cdot s}}{\left(-1 + e^{\pi \cdot s}\right) \cdot \left(s - i\right) \cdot \left(s + i\right)}\right)$

pass   T

$T := Test\left(\sum_{i=1}^{n} i \,,\, \frac{n \cdot \left(1 + n\right)}{2}\right)$ $\sum_{i=1}^{n} i = \frac{n \cdot \left(1 + n\right)}{2}$ pass   T

$T := Test\left(\sum_{i=1}^{n} \frac{1}{i} \,,\, \sum_{i=1}^{n} \frac{1}{i}\right)$ $\sum_{i=1}^{n} \frac{1}{i} = \blacksquare$ T

$T := SameError\left(description\left(n\_notDefined\right)\right)$ pass   T

$\text{time}(0) - t_0 = 11.02\,s$