Testo $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$

```
Maxima 5.36.1 http://maxima.sourceforge.net
using Lisp SBCL 1.2.10
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Dedicated to the memory of William Schelter.
The function bug_report() provides bug reporting information.
STYLE-WARNING: redefining MAXIMA::TEX-MATRIX in DEFUN
```

(%i22) `a:x^x;`

(%o22) x^x

(%i21) `b:x^x$`

(%i3) `c:x^x`

(%o3) x^x

(%i4) `d`

(%o4) d

(%i5) `diff(a,x)`

(%o5) $x^x \left(\log\left(x\right)+1\right)$

(%i9) `b:diff(a,x,4)`

(%o9) $x^{x-1}\left(\log\left(x\right)+\frac{x-1}{x}\right)^2+x^x\left(\log\left(x\right)+1\right)^4+3\,x^{x-1}\left(\log\left(x\right)+1\right)^2+2\,x^{x-1}\left(\log\left(x\right)+1\right)\left(\log\left(x\right)+\frac{x-1}{x}\right)+\left(\frac{2}{x}-\frac{x-1}{x^2}\right)x^{x-1}+2\,x^{x-2}$

(%i12) `c:expand(b)`

(%o12) $x^x\log\left(x\right)^4+4\,x^x\log\left(x\right)^3+6\,x^x\log\left(x\right)^2+6\,x^{x-1}\log\left(x\right)^2+4\,x^x\log\left(x\right)+12\,x^{x-1}\log\left(x\right)-4\,x^{x-2}\log\left(x\right)+x^x+6\,x^{x-1}-x^{x-2}+2\,x^{x-3}$

(%i13) `factor(c)`

(%o13) $x^{x-3}\left(x^3\log\left(x\right)^4+4\,x^3\log\left(x\right)^3+6\,x^3\log\left(x\right)^2+6\,x^2\log\left(x\right)^2+4\,x^3\log\left(x\right)+12\,x^2\log\left(x\right)-4\,x\log\left(x\right)+x^3+6\,x^2-x+2\right)$

(%i14) `collectterms(c,log(x))`

(%o14) $x^x\log\left(x\right)^4+4\,x^x\log\left(x\right)^3+\left(6\,x^x+6\,x^{x-1}\right)\log\left(x\right)^2+\left(4\,x^x+12\,x^{x-1}-4\,x^{x-2}\right)\log\left(x\right)+x^x+6\,x^{x-1}-x^{x-2}+2\,x^{x-3}$

(%i15) `diff(a)`

(%o15) $x^x\left(\log\left(x\right)+1\right)d\,x$

(%i16) `diff(x*y)`

(%o16) $x\,d\,y+y\,d\,x$

(%i17) `b`

(%o17) $x^{x-1}\left(\log\left(x\right)+\frac{x-1}{x}\right)^2+x^x\left(\log\left(x\right)+1\right)^4+3\,x^{x-1}\left(\log\left(x\right)+1\right)^2+2\,x^{x-1}\left(\log\left(x\right)+1\right)\left(\log\left(x\right)+\frac{x-1}{x}\right)+\left(\frac{2}{x}-\frac{x-1}{x^2}\right)x^{x-1}+2\,x^{x-2}$

```
(%i18) b:diff(a,x)
```

(%o18) $x^x\left(\log\left(x\right)+1\right)$

```
(%i20) (integrate(b,x))
```

(%o20) $\mathrm{e}^{x\log\left(x\right)}$

```
(%i23) %i22
```

(%o23) $a:x^x$

```
(%i24) %o22
```

(%o24) x^x

```
(%i25) %
```

(%o25) x^x

```
(%i29) A:matrix([1,2],[3,4])
```

(%o29) $\begin{pmatrix}1&2\\3&4\end{pmatrix}$

```
(%i31) B:invert(A)
```

(%o31) $\begin{pmatrix}-2&1\\\frac{3}{2}&-\frac{1}{2}\end{pmatrix}$

```
(%i32) A.B
```

(%o32) $\begin{pmatrix}1&0\\0&1\end{pmatrix}$

```
(%i33) B.A
```

(%o33) $\begin{pmatrix}1&0\\0&1\end{pmatrix}$

```
(%i34) A*B
```

(%o34) $\begin{pmatrix}-2&2\\\frac{9}{2}&-2\end{pmatrix}$

```
(%i40) C:eigenvalues(A)
```

(%o40) $\left[\left[-\frac{\sqrt{33}-5}{2},\frac{\sqrt{33}+5}{2}\right],[1,1]\right]$

```
(%i41) C[1]
```

(%o41) $\left[-\frac{\sqrt{33}-5}{2},\frac{\sqrt{33}+5}{2}\right]$

```
(%i42) C[1][1]
```

(%o42) $-\frac{\sqrt{33}-5}{2}$

```
(%i43) C[1][1]:2
```

(%o43) 2

```
(%i44) C
```

(%o44) $\left[\left[2, \frac{\sqrt{33}+5}{2}\right], [1,1]\right]$

```
(%i45) transpose(A)
```

(%o45) $\begin{pmatrix} 1 & 3 \\ 2 & 4 \end{pmatrix}$

```
(%i46) A
```

(%o46) $\begin{pmatrix} 1 & 2 \\ 3 & 4 \end{pmatrix}$

```
(%i47) e[x]
```

(%o47) e_x

```
(%i50) M:matrix([e[x],e[y],e[z]],[1,1,1],[1,1,0])
```

(%o50) $\begin{pmatrix} e_x & e_y & e_z \\ 1 & 1 & 1 \\ 1 & 1 & 0 \end{pmatrix}$

```
(%i51) determinant(M)
```

(%o51) $e_y - e_x$

```
(%i52) R:matrix([cos(theta),-sin(theta)],[sin(theta),cos(theta)])
```

(%o52) $\begin{pmatrix} \cos(\vartheta) & -\sin(\vartheta) \\ \sin(\vartheta) & \cos(\vartheta) \end{pmatrix}$

```
(%i57) expand(trigreduce(R.R))
```

(%o57) $\begin{pmatrix} \cos(2\,\vartheta) & -\sin(2\,\vartheta) \\ \sin(2\,\vartheta) & \cos(2\,\vartheta) \end{pmatrix}$

```
(%i55) R3:R.R.R
```

(%o55) $(\cos(\vartheta)\,(\cos(\vartheta)^2 - \sin(\vartheta)^2) - 2\cos(\vartheta)\sin(\vartheta)^2, -\sin(\vartheta)\,(\cos(\vartheta)^2 - \sin(\vartheta)^2) - 2\cos(\vartheta)^2\sin(\vartheta); \sin(\vartheta)\,(\cos(\vartheta)^2 - \sin(\vartheta)^2) + 2\cos(\vartheta)^2\sin(\vartheta), \cos(\vartheta)\,(\cos(\vartheta)^2 - \sin(\vartheta)^2) - 2\cos(\vartheta)\sin(\vartheta)^2)$

```
(%i59) trigreduce((trigreduce(R.R.R)))
```

(%o59) $\begin{pmatrix} \cos(3\,\vartheta) & -\sin(3\,\vartheta) \\ \sin(3\,\vartheta) & \cos(3\,\vartheta) \end{pmatrix}$

```
(%i60) R1:subst(theta=alpha[1],R)
```

(%o60) $\begin{pmatrix} \cos(\alpha_1) & -\sin(\alpha_1) \\ \sin(\alpha_1) & \cos(\alpha_1) \end{pmatrix}$

```
(%i61) R2:subst(theta=alpha[2],R)
```

(%o61) $\begin{pmatrix} \cos(\alpha_2) & -\sin(\alpha_2) \\ \sin(\alpha_2) & \cos(\alpha_2) \end{pmatrix}$

```
(%i63) trigreduce(R1.R2)
```

(%o63) $$\begin{pmatrix} \cos(\alpha_2+\alpha_1) & -\sin(\alpha_2+\alpha_1) \\ \sin(\alpha_2+\alpha_1) & \cos(\alpha_2+\alpha_1) \end{pmatrix}$$

```
(%i66) R^^(4)
```

(%o66) $(\cos(\vartheta)(\cos(\vartheta)(\cos(\vartheta)^2-\sin(\vartheta)^2)-2\cos(\vartheta)\sin(\vartheta)^2)+\sin(\vartheta)(-\sin(\vartheta)(\cos(\vartheta)^2-\sin(\vartheta)^2)-2\cos(\vartheta)^2\sin(\vartheta)),\cos(\vartheta)(-\sin(\vartheta)(\cos(\vartheta)^2-\sin(\vartheta)^2)-2\cos(\vartheta)^2\sin(\vartheta))-\sin(\vartheta)(\cos(\vartheta)(\cos(\vartheta)^2-\sin(\vartheta)^2)-2\cos(\vartheta)\sin(\vartheta)^2);\sin(\vartheta)(\cos(\vartheta)(\cos(\vartheta)^2-\sin(\vartheta)^2)-2\cos(\vartheta)\sin(\vartheta)^2)+\cos(\vartheta)(\sin(\vartheta)(\cos(\vartheta)^2-\sin(\vartheta)^2)+2\cos(\vartheta)^2\sin(\vartheta)),$
$\cos(\vartheta)(\cos(\vartheta)(\cos(\vartheta)^2-\sin(\vartheta)^2)-2\cos(\vartheta)\sin(\vartheta)^2)-\sin(\vartheta)(\sin(\vartheta)(\cos(\vartheta)^2-\sin(\vartheta)^2)+2\cos(\vartheta)^2\sin(\vartheta)))$

```
(%i67) R^(4)
```

(%o67) $$\begin{pmatrix} \cos(\vartheta)^4 & \sin(\vartheta)^4 \\ \sin(\vartheta)^4 & \cos(\vartheta)^4 \end{pmatrix}$$

```
(%i1) R(theta):=matrix([cos(theta),-sin(theta)],[sin(theta),cos(theta)])
```

(%o1) $$R(\vartheta):=\begin{pmatrix} \cos(\vartheta) & -\sin(\vartheta) \\ \sin(\vartheta) & \cos(\vartheta) \end{pmatrix}$$

```
(%i2) R(1)
```

(%o2) $$\begin{pmatrix} \cos(1) & -\sin(1) \\ \sin(1) & \cos(1) \end{pmatrix}$$

```
(%i4) trigreduce(R(alpha).R(beta))
```

(%o4) $$\begin{pmatrix} \cos(\beta+\alpha) & -\sin(\beta+\alpha) \\ \sin(\beta+\alpha) & \cos(\beta+\alpha) \end{pmatrix}$$

```
(%i6) a(x):=x^x
```

(%o6) $a(x):=x^x$

```
(%i7) a(sin(y))
```

(%o7) $\sin(y)^{\sin(y)}$

```
(%i8) b(f):=block(
      [s,z,t],
      s:f,
      z:diff(f,t),
      s^z
      )
```

(%o8) $b(f):=\textbf{block}([s,z,t],s\colon f,z\colon \mathrm{diff}(f,t),s^z)$

```
(%i9) b(t)
```

(%o9) t

```
(%i10) b(sin(t))
```

(%o10) $\sin(t)^{\cos(t)}$

```
(%i11) b(t^t)
```

(%o11) $(t^t)^{t^t(\log(t)+1)}$

```
(%i12) c(x,y):=block(
       [s,z,t],
       s:x+y,
       z:x-y,
       t:[s,z]
       )
```

(%o12) $c(x, y) := \textbf{block}\ ([s, z, t], s: x + y, z: x - y, t: [s, z])$

```
(%i13) c(a,b)
```

(%o13) $[b + a, a - b]$

```
(%i15) C:c(1,2)
```

(%o15) $[3, -1]$

```
(%i16) C[1]
```

(%o16) 3

```
(%i17) C[2]
```

(%o17) -1

```
(%i18)
```