FriCAS Computer Algebra System
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```
(3) -> integrate(1/(x * (a+b*x)^(1/3)),x)
```

$$\frac{-\log(\sqrt[3]{a}\,\sqrt[3]{b\,x+a}^2 + \sqrt[3]{a}^2\,\sqrt[3]{b\,x+a} + a) + 2\log(\sqrt[3]{a}^2\,\sqrt[3]{b\,x+a} - a) + 2\,\sqrt{3}\,\text{atan}(\frac{2\,\sqrt[3]{a}^2\,\sqrt[3]{b\,x+a} + a}{a\,\sqrt{3}})}{2\,\sqrt[3]{a}}$$

$$\text{Type: Union(Expression(Integer),...)}$$

```
(4) -> series(log(cot(x)),x = %pi/2)
```

$$\log(\frac{-2\,x+\pi}{2}) + \frac{1}{3}\,(x-\frac{\pi}{2})^2 + \frac{7}{90}\,(x-\frac{\pi}{2})^4 + \frac{62}{2835}\,(x-\frac{\pi}{2})^6 + \frac{127}{18900}\,(x-\frac{\pi}{2})^8 + \frac{146}{66825}\,(x-\frac{\pi}{2})^{10} +$$
$$O((x-\frac{\pi}{2})^{11})$$

$$\text{Type: GeneralUnivariatePowerSeries(Expression(Integer),x,\%pi/2)}$$

```
(5) -> M:=matrix [ [x + %i,0], [1,-2] ]
```

$$\begin{pmatrix} x+i & 0 \\ 1 & -2 \end{pmatrix}$$

$$\text{Type: Matrix(Polynomial(Complex(Integer)))}$$

```
(6) -> inverse(M)
```

$$\begin{pmatrix} \frac{1}{x+i} & 0 \\ \frac{1}{2\,x+2\,i} & -\frac{1}{2} \end{pmatrix}$$

$$\text{Type: Union(Matrix(Fraction(Polynomial(Complex(Integer)))),...)}$$

```
(7) -> S := [3*x^3 + y + 1 = 0,y^2 = 4]
```

$$[y + 3\,x^3 + 1 = 0,\, y^2 = 4]$$

$$\text{Type: List(Equation(Polynomial(Integer)))}$$

```
(8) -> radicalSolve(S)
```

$$[[y = 2, x = -1], [y = 2, x = \frac{-\sqrt{-3}+1}{2}], [y = 2, x = \frac{\sqrt{-3}+1}{2}], [y = -2, x = \frac{1}{\sqrt[3]{3}}], [y = -2,$$
$$x = \frac{\sqrt{-1}\,\sqrt{3}-1}{2\,\sqrt[3]{3}}], [y = -2, x = \frac{-\sqrt{-1}\,\sqrt{3}-1}{2\,\sqrt[3]{3}}]]$$

$$\text{Type: List(List(Equation(Expression(Integer))))}$$

```
(9) -> continuedFraction(6543/210)
```

$$31 + \cfrac{1}{6 + \cfrac{1}{2 + \cfrac{1}{1 + \frac{1}{3}}}}$$

$$\text{Type: ContinuedFraction(Integer)}$$

```
(11) -> (3*a^4 + 27*a - 36)::Polynomial PrimeField 7
```

$$3\,a^4 + 6\,a + 6$$

<div align="right">Type: Polynomial(PrimeField(7))</div>

```
(12) -> [i^2 for i in 1..10]
```

$$[1, 4, 9, 16, 25, 36, 49, 64, 81, 100]$$

<div align="right">Type: List(PositiveInteger)</div>

```
(13) -> [i for i in 1..10 | even?(i)]
```

$$[2, 4, 6, 8, 10]$$

<div align="right">Type: List(PositiveInteger)</div>

```
(14) -> [1..3,5,6,8..10]
```

$$[1..3, 5..5, 6..6, 8..10]$$

<div align="right">Type: List(Segment(PositiveInteger))</div>

```
(15) -> factor 6432380707485690237205944125517043441455707632
43
```

$$11^{13}\,13^{11}\,17^7\,19^5\,23^3\,29^2$$

<div align="right">Type: Factored(Integer)</div>

```
(16) -> roman(1992)
```

MCMXCII

<div align="right">Type: RomanNumeral</div>

```
(17) -> (2/3 + %i)^3
```

$$-\frac{46}{27} + \frac{1}{3}\,i$$

<div align="right">Type: Complex(Fraction(Integer))</div>

```
(18) -> q:=quatern(1,2,3,4)*quatern(5,6,7,8) - quatern(5,6,7,8)*quatern(1,2,3,
       4)
```

$$-8\,i + 16\,j - 8\,k$$

<div align="right">Type: Quaternion(Integer)</div>

```
(19) -> matrix([ [1/(i + j - x) for i in 1..4] for j in 1..4])
```

$$\begin{pmatrix}
-\frac{1}{x-2} & -\frac{1}{x-3} & -\frac{1}{x-4} & -\frac{1}{x-5} \\
-\frac{1}{x-3} & -\frac{1}{x-4} & -\frac{1}{x-5} & -\frac{1}{x-6} \\
-\frac{1}{x-4} & -\frac{1}{x-5} & -\frac{1}{x-6} & -\frac{1}{x-7} \\
-\frac{1}{x-5} & -\frac{1}{x-6} & -\frac{1}{x-7} & -\frac{1}{x-8}
\end{pmatrix}$$

<div align="right">Type: Matrix(Fraction(Polynomial(Integer)))</div>

```
(20) -> p: UP(x,INT) := (3*x-1)^2 * (2*x + 8)
```

$$18\,x^3 + 60\,x^2 - 46\,x + 8$$

```
(21) -> g := csc(a*x) / csch(b*x)
```

$$\frac{\csc(a\,x)}{\operatorname{csch}(b\,x)}$$

Type: Expression(Integer)

```
(22) -> limit(g,x=0)
```

$$\frac{b}{a}$$

Type: Union(OrderedCompletion(Expression(Integer)),...)

```
(23) -> h := (1 + k/x)^x
```

$$\frac{x + k^x}{x}$$

Type: Expression(Integer)

```
(24) -> limit(h,x=%plusInfinity)
```

$$e^k$$

Type: Union(OrderedCompletion(Expression(Integer)),...)

```
(25) -> series(sin(a*x),x = 0)
```

$$a\,x - \frac{a^3}{6}\,x^3 + \frac{a^5}{120}\,x^5 - \frac{a^7}{5040}\,x^7 + \frac{a^9}{362880}\,x^9 - \frac{a^{11}}{39916800}\,x^{11} + O(x^{12})$$

Type: UnivariatePuiseuxSeries(Expression(Integer),x,0)

```
(26) -> series(sin(a*x),x = %pi/4)
```

$$\sin(\frac{a\,\pi}{4}) + a\cos(\frac{a\,\pi}{4})\,(x - \frac{\pi}{4}) - \frac{a^2\sin(\frac{a\,\pi}{4})}{2}\,(x - \frac{\pi}{4})^2 - \frac{a^3\cos(\frac{a\,\pi}{4})}{6}\,(x - \frac{\pi}{4})^3 + \frac{a^4\sin(\frac{a\,\pi}{4})}{24}\,(x -$$

$$\frac{\pi}{4})^4 + \frac{a^5\cos(\frac{a\,\pi}{4})}{120}\,(x - \frac{\pi}{4})^5 - \frac{a^6\sin(\frac{a\,\pi}{4})}{720}\,(x - \frac{\pi}{4})^6 - \frac{a^7\cos(\frac{a\,\pi}{4})}{5040}\,(x - \frac{\pi}{4})^7 + \frac{a^8\sin(\frac{a\,\pi}{4})}{40320}\,(x - \frac{\pi}{4})^8 +$$

$$\frac{a^9\cos(\frac{a\,\pi}{4})}{362880}\,(x - \frac{\pi}{4})^9 - \frac{a^{10}\sin(\frac{a\,\pi}{4})}{3628800}\,(x - \frac{\pi}{4})^{10} + O((x - \frac{\pi}{4})^{11})$$

Type: UnivariatePuiseuxSeries(Expression(Integer),x,%pi/4)

```
(27) -> series(n +-> (-1)^((3*n - 4)/6)/factorial(n - 1/3),x=0,4/3..,2)
```

$$x^{\frac{4}{3}} - \frac{1}{6}\,x^{\frac{10}{3}} + O(x^5)$$

Type: UnivariatePuiseuxSeries(Expression(Integer),x,0)

```
(28) -> f := taylor(exp(x))
```

$$1 + x + \frac{1}{2}\,x^2 + \frac{1}{6}\,x^3 + \frac{1}{24}\,x^4 + \frac{1}{120}\,x^5 + \frac{1}{720}\,x^6 + \frac{1}{5040}\,x^7 + \frac{1}{40320}\,x^8 + \frac{1}{362880}\,x^9 + \frac{1}{3628800}\,x^{10} +$$

$$O(x^{11})$$

Type: UnivariateTaylorSeries(Expression(Integer),x,0)

```
(29) -> F := operator 'F; x := operator 'x; y := operator 'y
```

$$y$$

```
(30) -> a := F(x z, y z, z^2) + x y(z+1)
```

$$x(y(z+1)) + F(x(z), y(z), z^2)$$

Type: Expression(Integer)

```
(31) -> dadz := D(a, z)
```

$$2\,z\,F_{,3}(x(z), y(z), z^2) + y'(z)\,F_{,2}(x(z), y(z), z^2) + x'(z)\,F_{,1}(x(z), y(z), z^2) + x'(y(z+1))\,y'(z+1)$$

Type: Expression(Integer)

```
(32) -> eval(eval(dadz, 'x, z +-> exp z), 'y, z +-> log(z+1))
```

$$\frac{(2\,z^2 + 2\,z)\,F_{,3}(e^z, \log(z+1), z^2) + F_{,2}(e^z, \log(z+1), z^2) + (z+1)\,e^z\,F_{,1}(e^z, \log(z+1), z^2) + z + 1}{z+1}$$

Type: Expression(Integer)

```
(33) -> eval(eval(a, 'x, z +-> exp z), 'y, z +-> log(z+1))
```

$$F(e^z, \log(z+1), z^2) + z + 2$$

Type: Expression(Integer)

```
(34) -> D(%, z)
```

$$\frac{(2\,z^2 + 2\,z)\,F_{,3}(e^z, \log(z+1), z^2) + F_{,2}(e^z, \log(z+1), z^2) + (z+1)\,e^z\,F_{,1}(e^z, \log(z+1), z^2) + z + 1}{z+1}$$

Type: Expression(Integer)

```
(35) -> integrate(1/(u^2 + a),u)
```

$$\left[\frac{\log(\frac{(-x(y(z+1)) - F(x(z), y(z), z^2) + u^2)\,\sqrt{-x(y(z+1)) - F(x(z), y(z), z^2)} + 2\,u\,x(y(z+1)) + 2\,u\,F(x(z), y(z), z^2)}{x(y(z+1)) + F(x(z), y(z), z^2) + u^2})}{2\,\sqrt{-x(y(z+1)) - F(x(z), y(z), z^2)}},\right.$$

$$\left.\frac{\operatorname{atan}(\frac{u\,\sqrt{x(y(z+1)) + F(x(z), y(z), z^2)}}{x(y(z+1)) + F(x(z), y(z), z^2)})}{\sqrt{x(y(z+1)) + F(x(z), y(z), z^2)}}\right]$$

Type: Union(List(Expression(Integer)),...)

```
(36) -> integrate(log(1 + sqrt(a*u + b)) / u,u)
```

$$\int^u \frac{\log(\sqrt{\%A\,x(y(z+1)) + \%A\,F(x(z), y(z), z^2) + b} + 1)}{\%A}\,d\%A$$

Type: Union(Expression(Integer),...)

```
(37) -> )quit
```

Busy...

```
(37) ->
```

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