Miscellaneous

`Enter` or `Shift+Enter` evaluates a cell

`;` End of command/Show output

`$` End of command/Suppress output

`%` Most recent output

`%th(5)` 5th previous output

`:` Assignment e.g. $x : 2$ or $f : x^2 + 1$

`:=` Function definition e.g. $f(x) := \sin(x)$

`'` Prevents evaluation

`/* ... */` Comments

`kill(...)` Delete variables or expressions

Constants

`%pi` $\pi = 3.14159\ldots$

`%e` $e = 2.71828\ldots$

`%gamma` Euler's constant, $\gamma = 0.5772\ldots$

`%i` Imaginary unit, $i = \sqrt{-1}$

`%phi` Golden ratio, $\phi = 1.618\ldots$

`inf` Infinity, ∞

`minf` Negative infinity, $-\infty$

Numerics

`float(x)` Decimal form (Default: 16 digits)

`fpprintprec` Digits displayed by `float(x)`

`bfloat(x)` Decimal form with `fpprec` digits

`fpprec` Floating-point precision

Equations

```
solve( x^2-3*x+2=0, x )
find_root( cos(x)=x, x, 0, 1 )
linsolve( [x+y=0, 2*x+3*y=2], [x,y] )
ode2( 'diff(y,x) = -x*y, y, x )
```

`rhs( x^2+x=cos(x) )` Right-hand side

Simplifying

```
factor( x^2-3*x+2 )
expand( (x+3)*(2*x+1)^3 )
partfrac( 1/(x^2-x), x )
ratsimp( 1/x + 1/(x-1) )
radcan( sqrt(135) )
trigsimp( sin(5)^2 + cos(5)^2 )
trigreduce( cos(x)^3 )
```

Evaluation/Substitution

```
f(x):=x*sin(x); f(2)
subst( 2, x, f )
at( f, x=2 )
```

Calculus

```
limit( sin(x)/x, x, 0 )
limit( abs(x)/x, x, 0, plus )
diff( f, x )
diff( f, x, 2 )
depends( y, x ); diff( x*y=sin(x), x );
         solve( %, 'diff( y, x ) )
integrate( g, x )
integrate( g, x, 0, 5 )
sum( 1/k, k, 1, 25 )
taylor( exp(x), x, 0, 6 )
```

Vectors & the vect1 package

Must load vect1 package

```
u: [1,2,3];  v: [-1,0,3]
```

`norm( u )` Magnitude

`normalize( u )` Unit vector

```
dot( u, v )
cross( u, v )
angle( u, v )
```

`proj( u, v )` $\text{proj}_v\, u$

Basic plotting

```
plot2d( sin(x), [x,-5,5] )
plot2d( sin(x), [x,-5,5], [y,-2,2] )
plot2d( [sin(x),cos(x)], [x,-3,3] )
plot3d( x^2-3*sin(x)*y, [x,-5,5], [y,-5,5] )
```

Matrices & lists

```
x: [3,6,9,12,15]
```

`x[2]` Element 2 of list x

```
A: matrix( [2,1], [-1,3] )
```

`A[i][j]` ij-element of A

`A+B` Matrix addition

`A.B` Matrix multiplication

`A^^(-1)` Matrix inverse

`determinant(A)`