Maple 6: A Quick Reference

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(January 1995, original version for Maple V, Release 3)

Symbols and Abbreviations

<table>
<tr><th>Symbol</th><th>Description</th><th>Example</th></tr>
<tr><td>:=</td><td>assignment</td><td>f := x^2/y^3;</td></tr>
<tr><td>;</td><td>terminate command; display result</td><td>int(x^2, x);</td></tr>
<tr><td>:</td><td>terminate command; hide result</td><td>int(x^2, x):</td></tr>
<tr><td>..</td><td>specify a range or interval</td><td>plot(t*exp(-2*t), t=0..3);</td></tr>
<tr><td>{ }</td><td>set delimiter (a set is an unordered list)</td><td>{ y, x, y };</td></tr>
<tr><td>[ ]</td><td>list delimiter (lists are ordered)</td><td>[y, x, y];</td></tr>
<tr><td>%</td><td>refers to previous result (percent)
Note: Was " until Maple V, Release 5</td><td>Int(exp(x^2), x=0..1):
% = evalf(%);</td></tr>
<tr><td>" "
(see ?strings)</td><td>string delimiter (double quote)
Note: Changed in Maple V, Release 5 (see %)</td><td>plot(sin(10*x) + 3*sin(x), x=0..2*Pi,
title="An interesting plot");</td></tr>
<tr><td>` ` (see ?names)</td><td>name delimiter (back quote)</td><td>`A name` := `This is a name.`;</td></tr>
<tr><td>||
(see also ?cat)</td><td>concatenate string or name
Note: Was . prior to Maple 6</td><td>a||3;
a||(1..3);</td></tr>
<tr><td>´ ´ (see ?uneval)</td><td>delayed evaluation (single quote)</td><td>x := ´x´;</td></tr>
<tr><td>->
(see ?-> and ?proc)</td><td>mapping (procedure) definition</td><td>f := (x,y) -> x^2*sin(x-y);
f(Pi/2,0);</td></tr>
<tr><td>@</td><td>composition operator</td><td>(cos@arcsin)(x);</td></tr>
<tr><td>@@</td><td>repeated composition operator</td><td>(D@@2)(ln);</td></tr>
</table>

Mathematical Operations, Functions, and Constants

Symbol	Description	Example
`+`, `-`, `*`, `/`, `^`	add, subtract, multiply, divide, power	`3*x^(-4) + x/Pi;`
`sin`, `cos`, `tan`, `cot`, `sec`, `csc`	trigonometric functions	`sin( theta-Pi/5 ) - sec( theta^2 );`
`arcsin`, `arccos`, `arctan`, `arccot`, `arcsec`, `arccsc`	inverse trigonometric functions	`arctan( 2*x );`
`exp`	exponential function	`exp( 2*x );`
`ln`	natural logarithm	`ln( x*y/2 );`
`log10`	common logarithm (base 10)	`log10( 1000 );`
`abs`	absolute value	`abs( (-3)^5 );`
`sqrt`	square root	`sqrt( 24 );`
`!`	factorial	`k!;`
`=`, `<>`, `<`, `<=`, `>`, `>=`	equations and inequalities *Note*: `E` no longer exists; use `exp(1)`	`diff( y(x), x ) + x*y(x) = F(x);` `exp(Pi) > Pi^exp(1);`
`Pi`, `I`	π, i (mathematical constants) *Note*: Maple is case-sensitive	`exp( Pi*I );`
`infinity`	infinity (∞)	`int( x^(-2), x=1..infinity );`

NOTES:

- The document is also available on the World Wide Web in either PDF (http://www.math.sc.edu/~meade/maple/maple-ref.pdf) or PostScript (http://www.math.sc.edu/~meade/maple/maple-ref.ps).
- Please send comments, corrections, and suggestions for improvements to meade@math.sc.edu.

Commands

Command	Description	Example
restart	clear all Maple definitions	restart:
with	load a Maple package	with(DEtools); with(plots):
help (also ?)	display Maple on-line help	?DEplot
limit	calculate a limit	limit(sin(a*x)/x, x=0);
diff	compute the derivative of an expression	diff(a*x*exp(b*x^2)*cos(c*y), x)
int	definite or indefinite integration	int(sqrt(x), x=0..Pi);
Limit	inert (unevaluated) form of limit	Limit(sin(a*x)/x, x=0);
Diff	inert (unevaluated) form of diff	Diff(a*x*exp(b*x^2)*cos(c*y), x);
Int	inert (unevaluated) form of int	Int(sqrt(x), x=0..Pi);
value	evaluate an inert expression (typically used with Limit, Diff, or Int)	G := Int(exp(-x^2), x); value(G);
plot	create a 2-dimensional plot	plot(u^3, u=0..1, title="cubic");
plot3d	create a 3-dimensional plot	plot3d(sin(x)*cos(y),x=0..4*Pi,y=0..Pi);
display	combine multiple plot structures into a single plot or modify optional settings in a plot (in plots package)	F:=plot(exp(x), x=0..3, style=line); G:=plot(1/x, x=0..3, style=point); plots[display]([F,G], title="2 curves");
solve	solve equations or inequalities	solve(x^4 - 5*x^2 + 6*x = 2, { x });
fsolve	solve using floating-point arithmetic	fsolve(t/10 + t*exp(-2*t) = 1, t);
dsolve	solve ordinary differential equations; see ?dsolve for a list of available options	dsolve(diff(y(x),x)-y(x)=1, y(x));

odeplot	create 2D and 3D plots from solutions obtained by dsolve (with type=numeric);
	see ?odeplot for more options
	(in plots package)
		S:=diff(x(t),t)=-y(t),diff(y(t),t)=x(t):
		IC:=x(0)=1,y(0)=1:
		P:=dsolve({S,IC}, {x(t),y(t)}, numeric):
		odeplot(P, [[t,x(t)],[t,y(t)]], 0..Pi);
		odeplot(P, [x(t),y(t)], 0..Pi);

DEplot	create plot associated with an ODE or system of ODEs; see ?DEplot for more information (in DEtools package)	ODE := diff(y(x),x) = 2*x*y(x); DEplot(ODE, [y(x)], x=-2..2, y=-1..1, arrows=SMALL);
D	differential operator (often used when specifying derivative initial conditions for dsolve)	ODE := diff(y(x),x$2) +y(x) = 1; IC := y(0)=1, D(y)(0)=1; dsolve({ ODE, IC }, y(x));
simplify	apply simplification rules to an expression	simplify(exp(a+ln(b*exp(c))));
factor	factor a polynomial	factor((x^3-y^3)/(x^4-y^4));
convert	convert an expression to a different form	convert(x^3/(x^2-1), parfrac, x);
collect	collect coefficients of like powers	collect((x+1)^3*(x+2)^2, x);
rhs	right-hand side of an equation	rhs(y = a*x^2 + b);
lhs	left-hand side of an equation	lhs(y = a*x^2 + b);
numer	extract the numerator of an expression	numer((x+1)^3/(x+2)^2);
denom	extract the denominator of an expression	denom((x+1)^3/(x+2)^2);
subs	substitute values into an expression	subs(x=r^(1/3), 3*x*ln(x^3));
eval	evaluate an expression with specific values	eval(3*x*ln(x^3), x=r^(1/3));
evalf	evaluate using floating-point arithmetic	evalf(exp(Pi^2));
evalc	evaluate a complex-valued expression (returns a value in the form a+I*b)	evalc(exp(alpha+I*omega));
evalb	evaluate a Boolean expression (returns true or false or FAIL)	evalb(evalf(exp(Pi) > Pi^exp(1)));
assign	perform assignments (often used after solve or dsolve)	S:=solve({x+y=1, 2*x+y=3}, {x,y}); assign(S); x; y;
seq	create a sequence	seq([0,i], i=-3..3);

for ... from ...
to ... by ... in ...
while ... do
... end do
	repetition statement; see ?do for syntax
	(Note: od is an acceptable substitute for end do)
		tot := 0;
		for i from 11 by 2 while i < 100 do
		tot := tot + i^2
		end do;

if ... then ... elif ... else ... end if	conditional statement; see ?if for syntax (Note: fi is an acceptable substitute for end if)	if type(x,name) then 'f'(x) else x+1 end if;
assume	inform Maple of additional properties of objects	assume(t>0);
about	check assumptions on Maple objects	about(t);