

# Maple 6: A Quick Reference

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## Symbols and Abbreviations

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

## Mathematical Operations, Functions, and Constants

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

### 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](mailto: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 );