

## Maple quick reference

January 28, 2010

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### Starting and stopping

To start:

- Click on maple leaf icon.
- Type Maple commands at the prompt: `>`.

To quit:

- Select **Exit** from the **File** menu.

### Getting help

- Type `help(command)` or `?command` or
- click on the command, then click on the **Help** menu and select help on that command.

### Notes

- All commands end with a semicolon.
- The symbol `%` refers to the previous output.
- Maple distinguishes between upper- and lower-case letters. Constants start with a capital letter (e.g., `Pi` for  $\pi$ ), while function names and commands are generally in lower case (e.g., `sin(x)`).

### Editing input

- To copy a command, drag the mouse pointer across the command to highlight it, and click on the **Copy** icon (two sheets of paper).
- To paste a copied command, click the left mouse button at the point where you want to insert the command, and click on the **Paste** icon (a clipboard).
- To edit a command, use arrow keys or the left mouse button to move the cursor; type to insert, backspace to delete.

### Mathematical functions

<code>sqrt(a)</code>	<code>sin(x)</code>	<code>arcsin(x)</code>	<code>gcd(a,b)</code>
<code>abs(a)</code>	<code>cos(x)</code>	<code>arccos(x)</code>	<code>lcm(a,b)</code>
<code>exp(a)</code>	<code>tan(x)</code>	<code>arctan(x)</code>	<code>max(a,b)</code>
<code>ln(a)</code>			<code>min(a,b)</code>

### Defining new functions

To define a function  $f(x) = x \sin x$  type

```
f := x -> x * sin(x);
```

You may then use this function in various contexts:

```
diff( f(x), x );  
int( f(x), x );  
plot( f(x), x = lo..hi );
```

## Common Maple commands

	command	example	result
factor	<code>factor( expr );</code>	<code>factor(x^2 - 4);</code>	$(x - 2)(x + 2)$
expand	<code>expand( expr );</code>	<code>expand((x-2)*(x+2));</code>	$x^2 - 4$
simplify	<code>simplify( expr );</code>	<code>simplify(x*(x-3)^2/(x-3));</code>	$x(x - 3)$
substitute	<code>subs( var=expr, expr );</code>	<code>subs(x=y-1, x^3);</code>	$(y - 1)^3$
evaluate	<code>evalf( expr );</code>	<code>evalf(sin(Pi/4));</code>	.7071067810
solve	<code>solve( eqn );</code>	<code>solve(x^2 = 1);</code>	1, -1
	<code>solve( eqn, var );</code>	<code>solve(3*x+y = 5, x);</code>	$-\frac{1}{3}y + \frac{5}{3}$
	<code>fsolve( eqn, var, lo..hi );</code>	<code>fsolve(cos(x)=x,x,0..2);</code>	.7390851332
limit	<code>limit( expr, var=expr );</code>	<code>limit(x^2, x=3)</code>	9
differentiate	<code>diff( expr, var );</code>	<code>diff(x^2 + 3, x);</code>	$2x$
integrate	<code>int( expr, var );</code>	<code>int(2*x*ln(x), x);</code>	$x^2 \ln(x) - \frac{1}{2}x^2$
	<code>int( expr, var=lo..hi );</code>	<code>int(sin(x), x=0..Pi);</code>	2
sum	<code>sum( expr, var=lo..hi );</code>	<code>sum((2/3)^n, n=1..10);</code>	$\frac{116050}{59049}$
graphing	<code>plot( expr, var=lo..hi );</code>	<code>plot(x^2, x=-2..2);</code>	graph of $y = x^2$
	<code>plot([ expr, expr, var=lo..hi ] );</code>	<code>plot([cos(t),sin(t), t=0..2*Pi]);</code>	graph of $(x, y) = (\cos(t), \sin(t))$
	<code>plot3d( expr, var=lo..hi, var=lo..hi, axes=framed );</code>	<code>plot3d(x*y, x=-2..2, y=-3..3);</code>	graph of $z = xy$
	<code>contourplot( expr, var=lo..hi, var=lo..hi, contours = num );</code>	<code>contourplot(x*y, x=-2..2, y=-3..3, contours=20);</code>	20 level curves of $z = xy$

Warning: The command `contourplot` is not part of the basic Maple package. To call up the plotting package that includes `contourplot`, type

`with(plots):`

### Maple syntax and semantics

- Most Maple commands have the form `Name := Expression`. Such an “assignment statement” has the following meaning: The value of the Expression is calculated and then the result of the calculation is assigned to the Name. Note the required use of the colon-equal sign. Example: `y := x^3;`
- A Maple Expression can consist of a collection of subexpressions. Sometimes the collection of subexpressions is a List, which is indicated by square brackets, as in `[cos(t), sin(t)];` sometimes the collection is a Set, which is indicated by curly braces, as in `{cos(t), sin(t)}.` Sometimes Maple allows either List notation or Set notation, but sometimes the difference between the two is significant; pay close attention to which notation is required.
- You can call up additional libraries of Maple functions by using the `with` command, as in `with(plots);`
- Maple never forgets the value that has been assigned to a Name, unless you tell it to. To avoid confusion, don’t use the same name (such as `x`) over and over unless you want to use its assigned value. The `restart` command will cause Maple to forget the values of all Names. Also you can cause Maple to forget the value of a single Name as follows: `x := 'x';`
- When you exit from Maple, it forgets the values of all the Names. Even if you open a worksheet that includes output indicating the value of some Names, Maple does not have those values stored in its memory and you cannot use them until you re-execute the commands that created them.

### The three bars

- At the top of the Maple window are the Menu Bar, followed by the Tool Bar, and then the Context Bar.
- The most frequently used selections in the menus can be selected more quickly by clicking the corresponding icons in the Tool Bar. Here are some useful selections that do not have icons. In the File menu, `Save As`; in the Edit menu, `Find`, `Execute / Worksheet`, `Remove Output / From Worksheet`; in the View menu, `Expand All Sections`; in the Format menu, `Convert to / Standard Math`; in the Options menu, `Plot Display`; in the Window menu, `Tile`.
- Meanings of the most important icons (almost all of which have equivalents in the menus): `File / New` (blank sheet of paper), `File / Open` (open folder), `File / Save` (diskette), `File / Print` (printer), `Edit / Cut` (scissors), `Edit / Copy` (two sheets of paper), `Edit / Paste` (clipboard), `Edit / Undo` (left curved arrow), `Insert / Text` (capital T), `Insert / Maple Input` (Maple prompt), interrupt a long computation (stop sign), `View / Zoom Factor / 100%` , `150%` , `200%` (three magnifying glasses).
- The Context Bar is different for each type of region: Input region, Output region, Text region, 2D Plot, and 3D Plot.