Maple 15 Quick Reference Card

Mac® OS X version

Document Mode vs. Worksheet Mode

Maple offers two primary modes of problem entry and content creation: Document mode and Worksheet mode. Both modes have respective advantages and you can easily switch from one mode to the other for maximum flexibility.

Document Mode	Worksheet Mode
• Quick problem-solving and free-form, rich content composition • No prompt (>) displayed • Math is entered and displayed in 2-D • Solve math problems with Control - **click** menu on input and output	• Traditional Maple problem-solving environment • Enter problems at a prompt (>) • Math entered and displayed in 2-D or 1-D • Press Return to evaluate expression • Solve math problems with **right-click** menu on math expressions

Document mode lets you create rich content. For example, the following solves for x without any commands: $\frac{x-2}{\alpha}=1 \xrightarrow{\text{solve for x}} [[x=2+\alpha]]$	The command to perform the same operation can be entered in 2-D Math:
	`> solve((x-2)/α=1,x)`
	$2+\alpha$
	or in 1-D Maple notation:
	`> solve((x-2)/alpha=1,x);`
	$2+\alpha$

Toggle Math/Text entry mode	F5 or Text Math Text Math on toolbar
Evaluate math expression and display result inline	⌘ =
Evaluate math expression and display result on new line	Return
Switch to Worksheet mode (insert prompt)	[> on toolbar
Show hidden commands	**View ⟶ Expand Document Block**
Toggle 2-D/1-D Math entry mode	F5 2-D black font, `1-D red font`
Evaluate math expression and display result on new line	Return
Continue on next line without executing	Shift Return
Switch to Document mode	**Format ⟶ Create Document Block**
Hide commands. Show only results.	Highlight commands to be hidden. **Format ⟶ Create Document Block**

Common Operations Available in Both Document and Worksheet Modes

Display quick help	⌘ Shift ? for **Quick Help**. ⌘ F2 for **Quick Reference Card** (this guide)
Refer to previous result using equation numbers	⌘ L then enter equation number in dialog
Recompute calculations within a line	! on toolbar
Recompute all calculations in a document	!!! on toolbar
Symbol selection, e.g. ε	Enter leading characters or Esc (or ⌘ Shift Space) e.g. `eps` Esc
Command completion, e.g. Lambert W function	Enter leading characters or Esc (or ⌘ Shift Space) e.g. `Lamb` Esc
Perform context operation on math expression	Control - **click** any math expression
Insert prompt	[> on toolbar
Insert text paragraph	T on toolbar
Drag a copy of an expression to a new location	Highlight the expression, hold ⌘, and drag to a new location

2-D Math Editing Operations, Keyboard Shortcuts, and Operations

Navigate through expression	← ↓ → ↑
Move cursor to different level in expression, e.g. out of exponent	→
Navigate through placeholders	Tab
Add, remove, rearrange palettes	**View ⟶ Palettes ⟶ Arrange Palettes** or Control - **click** palette
Fraction $\frac{x}{y}$, superscript x^n, subscript x_n	`x/y, x^n, x_n`
Prime notation for derivatives, e.g. $y''+y'=0$ for $\frac{d^2y}{dx^2}+\frac{dy}{dx}=0$	`y'' + y' = 0`
Square root $\sqrt{x}$, nth root $\sqrt[n]{x}$	Enter leading characters `sqrt`, Esc `nthroot` Esc
Symbol above, e.g. $\vec{x}$	`x` ⌘ Shift " then insert symbol, e.g. → from **Arrows** palette
To enter literal characters (_, ^, etc.), precede character with \ (backslash)	e.g. `foo\_bar` produces `foo_bar`
Greek letter entry mode (single letter)	⌘ Shift G
Special characters and symbols: Enter leading characters and Esc	π, e, i — `pi`, `e`, `i` ∞ — `infin` α, λ — `alpha`, `lambda` $\geq$, $\leq$, $\neq$, $\pm$ — `geq`, `leq`, `ne`, `pm`

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Expressions vs. Functions

Operations	Expression x^2+y^2	Function (operator) $g(x,y) = x^2+y^2$
Definition	`f := x^2 + y^2;`	`g := (x,y) -> x^2+y^2;`
Evaluate at x=1, y=2	`eval(f, [x=1,y=2]);` produces 5	`g(1,2);` produces 5
3-D plot for x from 0 to 1, y from 0 to 1	`plot3d(f,x=0..1,y=0..1);`	`plot3d(g(x,y),x=0..1,y=0..1);`

Conversion to other form	`f2 := unapply(f,x,y);`
	`f2(1,2);`
	produces 5
		`g2 := g(x,1);`
		`g2 + z;`
		produces x^2+1+z

Important Maple Syntax

`:=` Assignment	`a:=2; b:=3+x; c:=a+b;` produces $5 + x$ for `c`
`=` Mathematical equation	`solve(2*x + a = 1,x);` produces $x = \frac{1-a}{2}$
`=` Boolean equality	`if a = 0 then …`
Suppress display of output	Terminate command with a colon, e.g. `1000! :`
[ ] List (ordered)	`z:=[c, b, a]; z[1];` produces c
{ } Set (unordered, no duplicates)	`{a, b, a, c};` produces $\{a,b,c\}$
Display help on topic	`?topic`

Mathematical Operations

Common manipulations (simplify, factor, expand,…)	Control - **click** expression and select from menu
Solve equations	Control - **click** equation ⟶ **Solve**
Solve numerically (floating-point)	Control - **click** equation ⟶ **Numerically Solve**
Solve ODE	Control - **click** DE expression ⟶ **Solve DE Interactively**
Integrate, differentiate	Control - **click** expression ⟶ **Integrate** or **Differentiate**
Evaluate expression at a point	Control - **click** expression ⟶ **Evaluate at a Point**
Create a matrix or vector	Matrix palette ⟶ **Choose** ⟶ **Insert**
Invert, transpose, solve matrix	Control - **click** matrix ⟶ **Standard Operations** ⟶ select **Inverse**, **Transpose**, …
Evaluate as floating-point	Control - **click** expression ⟶ **Approximate**
Various operations and tasks	Use Task Templates: **Tools** ⟶ **Tasks** ⟶ **Browse**

Input and Output

Interactive data import assistant	**Tools** ⟶ **Assistants** ⟶ **Import Data**
Import audio or image file	**Tools** ⟶ **Assistants** ⟶ **Import Data**
Code generation (C, Visual C#®, FORTRAN, Java, Visual Basic®, MATLAB®)	Control - **click** expression ⟶ **Language Conversions**. See **?CodeGeneration** for help and details.
Publish document in HTML or LaTeX	**File** ⟶ **Export As** ⟶ select **HTML** or **LaTeX**
Publish document in PDF	**File** ⟶ **Print** ⟶ select **Save as PDF** from the drop-down menu

Plotting and Animation

Plot an existing expression	Control - **click** expression ⟶ **Plots** ⟶ **Plot Builder**
Plot new expression	**Tools** ⟶ **Assistants** ⟶ **Plot Builder**
Add new expression to existing plot	Highlight and drag expression into plot
Add annotations to plots	**Click** on plot, then Drawing on the toolbar
Animation and parameter plots for functions of several variables	Control - **click** expression ⟶ **Plots** ⟶ **Plot Builder** and select a plot type

Units and Tolerances

Add units to value or expression	Place cursor to right of quantity. Use **Units (SI)** or **Units (FPS)** palette or Control - **click** ⟶ **Units** ⟶ **Affix unit**.
Add arbitrary unit	[*unit*] from **Units (SI)** or **Units (FPS)** palette and enter desired unit
Simplify units in an expression	Control - **click** expression ⟶ **Units** ⟶ **Simplify**
Convert units	Control - **click** expression ⟶ **Units** ⟶ **Convert**
Enable automatic units simplification	`with(Units[Standard]);`
Enable tolerance calculations	`with(Tolerances);`
Tolerance quantity in 2-D Math	`9 pm` Esc `1.1` for 9 ± 1.1
Tolerance quantity in 1-D Math	`9 &+- 1.1;` for 9 ± 1.1

Select Interactive Tools and Utilities

Quick introductory tour	**Help** ⟶ **Take a Tour of Maple**
Show available task templates	**Tools** ⟶ **Tasks** ⟶ **Browse**
Plot Builder	Control - **click** expression ⟶ **Plots** ⟶ **Plot Builder**, or **Tools** ⟶ **Assistants** ⟶ **Plot Builder**
ODE Analyzer	**Tools** ⟶ **Assistants** ⟶ **ODE Analyzer**
Data Analysis Assistant	**Tools** ⟶ **Assistants** ⟶ **Data Analysis**
Unit Conversion utility	**Tools** ⟶ **Assistants** ⟶ **Units Calculator**
Back-Solving Assistant	**Tools** ⟶ **Assistants** ⟶ **BackSolver**
Apply numeric formatting	Control - **click** expression ⟶ **Numeric Formatting**
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Maplesoft
Mathematics • Modeling • Simulation

t. 519.747.2373 | f. 519.747.5284
800.267.6583 (US & Canada)
www.maplesoft.com | info@maplesoft.com

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