

Mathematica Quick Reference Sheet

Note: The purpose of this reference sheet is to give you quick reminders of the commands, shortcuts and general syntax rules that you learned in the *SCCC Mathematica Tutorial*. For more information see Tutorial.

Command	What it does...	Keyboard shortcuts
Clear [<i>x</i> , <i>y</i>]	Clears the variables <i>x</i> and <i>y</i> from <i>Mathematica's</i> memory	$\vdash \text{p} \vdash$ π
Clear [<i>f</i>]	Clears the function <i>f</i> from <i>Mathematica's</i> memory	<i>i.e.</i> $\text{ESC} \text{p} \text{ESC}$
Denominator [(<i>x</i> + 3) / (<i>x</i> ² - 4)]	Finds the denominator of the fractional expression.	$\vdash \text{ee} \vdash$ <i>e</i>
Expand [(<i>x</i> + 3) ⁴]	Expands and combines like terms	$\vdash \text{deg} \vdash$ $^{\circ}$
Factor [<i>x</i> ² - 5 <i>x</i> + 6]	Factors the expression.	
FindRoot [0.3 <i>x</i> == Cos [<i>x</i>] , { <i>x</i> , 1 }]	Find solution to 0.3 <i>x</i> = Cos [<i>x</i>] near <i>x</i> = 1	$\vdash \text{a} \vdash$ α
N [2/7] = 0.285714	Converts number to decimal.	$\vdash \text{b} \vdash$ β
N [2/7,10] = 0.2857142857	Converts number to decimal to specified number of digits.	$\vdash \text{g} \vdash$ γ
NSolve [<i>x</i> ³ - 9 <i>x</i> == <i>x</i> ² - 5 , <i>x</i>]	Finds <i>all</i> numerical solutions to polynomial equation.	
Numerator [(<i>x</i> + 3) / (<i>x</i> ² - 4)]	Finds the numerator of the fractional expression.	$\text{CTRL} \text{H} \text{2}$ square root
Range [0 , 200 , 25]	Create a list of numbers from 0 to 200 in increment of 25	$\text{CTRL} \text{H} \text{/}$ division
Range [8]	Create a list of positive integers up to 8 (i.e. { 1 , 2 , 3 , 4 , 5 , 6 , 7 , 8 })	$\text{CTRL} \text{H} \text{6}$ power
Simplify [45 <i>x</i> ⁸ /(3 <i>x</i> ⁵)]	Simplifies the expression.	
Simplify [Abs[<i>x</i> -5] , <i>x</i> > 7]	Simplifies the expression subject to the assumption given. Here because <i>x</i> > 7, Abs[<i>x</i> -5] = <i>x</i> -5.	
Solve [<i>x</i> ² - 5 <i>x</i> + 6 == 0 , <i>x</i>]	Solves equation for <i>x</i> .	Help on commands
Solve [{ <i>x</i> + <i>y</i> == 12 , 3 <i>x</i> - 4 <i>y</i> == 5 } , { <i>x</i> , <i>y</i> }]	Solves system of equations.	F1 key
Table [{ <i>x</i> , <i>f</i> [<i>x</i>] } , { <i>x</i> , - 6 , 10 , 2 }]	Create a table of values for { <i>x</i> , <i>f</i> [<i>x</i>] } as <i>x</i> increases from - 6 to 10 in increments of 2.	? <i>command</i>
TrigExpand [Cos [4 <i>x</i>]]	Expands trigonometric expression.	?? <i>command</i>
TrigFactor [Cos [<i>x</i>] ⁶ - Sin [<i>x</i>] ⁶]	Factors trigonometric expression.	Command completion: e.g. type: Plot $\text{CTRL} \text{H} \text{K}$
<i>/.</i> as in <i>x</i> ² - 3 <i>x</i> + 2 <i>/.</i> <i>x</i> → 3	Substitutes 3 for <i>x</i> in the expression <i>x</i> ² - 3 <i>x</i> + 2. <i>Does not change value of x.</i>	Command template: e.g. Plot $\text{CTRL} \text{H} \text{SFT} \text{H} \text{K}$
<i>a</i> ² + <i>b</i> ² <i>/.</i> { <i>a</i> -> 3 , <i>b</i> -> 5 }	Substitutes 3 for <i>a</i> and 5 for <i>b</i> in the expression <i>a</i> ² + <i>b</i> ² . <i>Does not change value of a or b.</i>	

Basic Functions	Trig Functions		The Six Most Important Rules of Mathematica Syntax
Abs [<i>x</i>] = absolute value function	Sin [<i>x</i>]	ArcSin [<i>x</i>]	Rule 1. Parentheses () are used for order of operations (algebraic grouping) purposes only.
Sqrt [<i>x</i>] = square root function	Cos [<i>x</i>]	ArcCos [<i>x</i>]	Rule 2. Mathematica commands and functions always start with a capital letter.
Exponential and Log Functions	Tan [<i>x</i>]	ArcTan [<i>x</i>]	Rule 3. Square brackets [] are used to enclose the inputs to commands and functions.
Exp [<i>x</i>] = natural exponential function	Csc [<i>x</i>]	ArcCsc [<i>x</i>]	Rule 4. To define a function in Mathematica use the form <i>f</i> [<i>x_</i>] := <i>x</i> ² .
Log [<i>x</i>] = ln(<i>x</i>), natural log function	Sec [<i>x</i>]	ArcSec [<i>x</i>]	Rule 5. Curly braces { } are used for lists only.
Log [<i>b</i> , <i>x</i>] = log base <i>b</i>	Cot [<i>x</i>]	ArcCot [<i>x</i>]	Rule 6. Equations are entered using double equal sign == .

Mathematica Quick Reference Sheet -- Plotting Commands

Command	What it does...
Plot [$\text{Sin}[x]$, { x , 0 , 2π }]	Plots the graph of function on domain specified.
Plot [{ x^2 , $2x + 1$ } , { x , - 5 , 5 }]	Plots the graphs of a list of functions on domain specified.
ContourPlot [$x^2 + y^2 = 25$, { x , - 6 , 6 } , { y , - 6 , 6 }]	Plots the graph of an equation in two variables.
... Axes → True ... Frame → None	common plot options for ContourPlot
... showing x and y axes ... without using a frame	
ListPlot [{ { x_1 , y_1 } , { x_2 , y_2 } , ... }]	Plot point(s) given
... PlotStyle → PointSize[<i>Medium</i>] ... Joined → True	common plot options for ListPlot
... using points that are medium-sized (can also use "Small" and "Large") ... and connect the points with line segments (see "ListLinePlot")	
ListLinePlot [{ { 0 , 0 } , { 5 , 5 } , { 8 , 2 } , { 0 , 0 } }]	Draws line segments between points given (this example draws a triangle!)
Show command is used to merge separate plots:	
graph1 = Plot [$3 * \text{Sin}[x]$, { x , - π , π }] ; graph2 = Plot [$-x^2 + 4$, { x , - 5 , 5 }] ; Show [{ <i>graph1</i> , <i>graph2</i> } , PlotRange → All]	First define each plot separately, give it a name and end the line with semicolon to suppress output. Then enter the plots to graph as a list in the Show command. Displays graph1 and graph2 in a single plot.

Plot options	What it does...
Note: All plot options come after the domain option(s), and each plot option is separated by a comma. [These are just a few of the most commonly used plot options—for more information on these (and others) see Mathematica's Help.]	
PlotRange → { y_{min} , y_{max} } (or Automatic or All or <i>number</i>)	Sets vertical range for plot window.
Exclusions → { x_1 , x_2 , ... , x_n }	Excludes specified values from plot domain.
PlotStyle → { Blue , Thick }	Sets color and line thickness for curves contained in plot.
Ticks → { Range [- 2π , 2π , $\pi/2$] , { -1 , -.5 , .5 , 1 } }	Specifies the labeling of tick marks on each axis.
GridLines → { Range [-4 , 4] , Range [0 , 16] }	Adds grid lines to plot.
PlotLabel → "This is the title of my graph"	Adds a title to the plot.
AxesLabel → { "years" , "Population (in millions)" }	Specifies labels for the axes
Background → LightYellow	Sets the background color for the plot.
Fill → Axis	Shades areas between graph and x-axis.