

Mathematica Quick Reference Guide

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(Summary of Primer by Dr. Chris Duffy, Civil Engineering)

To Start and Stop

math or mathematica (notebooks)
Quit

Denominator [(a + b) / (c + d)]
Cancel [x]

Parentheses and Brackets & Misc

() groups objects, ie (a+b)/(c+d)
[] function arguments, ie Sin[x]
{ } list elements { 1.2, 2.0, 3.0 }
% refers to previous output line
%% refers to second previous output line
Clear [x]

Functions

f[x_,y_] := x^2 + y^2 + Sin[x]
f[1,2]

Equations

Solve [a x^2 + b x + c == 0, x]
Solve [a x + b y == f, c x - d y == g, {x,y}]
FindRoot [x^3 + x^2 + x + 1 == 0, {x,1}]

Equal Signs

x = y set x = y right now
x == y test whether x and y are equal
x := y set delayed

Sums and Series

Sum [x^i / i! , {i,0,5}]
Series [Sin[x], {x,0,7}]

Help

?Plot gives help on Plot
??Plot gives detailed help on Plot

Complex Numbers

z = (4 + I) / (1 - I)
Re[z]
Im [z]
Abs [z]
Conjugate [z]
Solve [x^4 + x == 0, x]

Simple Arithmetic

(2.389 + 8.21)*(12^2 + 4 - 7)
2 Pi / 3
E^(I Pi)
N[E^(I Pi)]

Differentiation

D [x^3, x], first derivative
D [x^3, {x, 2}], second derivative
D [Exp [x^2 + y^2] , x], partial derivative
f [x_] := x / (x^2 + 1)
f ' [x]
D [f[x], x]

Plotting

Plot[Cos[x], { x , -3 Pi, 3 Pi }]
Plot3D[x^2 + y^2, {x,-10,10}, {y,-10,10}]
ContourPlot[x^2+y^2, {x,-10,10}, {y,-10,10}]
Plot [{ f[x], g[x] }, { x, -3, 3 }]
ParametricPlot[{Cos[2 x], Sin[2 x]}, {t, 0, 2 Pi}]
Display ["file.dat", Out[3]]

Integration

Integrate [Sin[x + pi], x]
Integrate [Sin[x + pi], {x, -Pi, Pi}]
Integrate [x^2 + y^2, x, y]

Symbolic Algebra

Expand [(x+y) (x^2 - x y + y^2)]
Factor [x^3 + y^3]
Simplify [(x+y) (x^2 - x y + y^2)]
Apart [(a x + b) / ((x-r) (x-s))]
Together [a/b + c/d]
Numerator [(a + b) / (c + d)]

Matrices

```
A = { { 1, 0, 2}, {7, 1, 6}, {9, 1, 3} }  
Inverse [ A ]  
Transpose [ A ]  
Det [ A ]  
B = { 1, 2, -1 }  
LinearSolve [ A, B ]  
x = Inverse[ A ].B  
A.x
```

Differential Equations

```
DSolve [ { y'[t] + y[t] == 1, y[0]==0}, y[t],t]  
NDSolve [ { y'[t] + y[t] == 1, y[0]==0},  
          y[t],{t,0,5}]
```

Saving and Reading

```
Save [ "file.dat", A, B, x, Out[3] ]  
Display [ "file.dat", % ], where % is graphics  
Read [ "file.dat" ]  
Dump [ "file.dat" ]  
Write [ "file.dat", Out[1], Out[2] ]
```

Packages

On Suns:

```
$Path=Join[$Path,  
{"/tmp_mnt/usr/apps/mathematica2.2/Packages/"}
```

On IBM RS/6000:

```
$Path=Join[$Path, {"/usr/local/math/Packages/"}
```

On SGI's:

```
$Path=Join[$Path,  
{"/tmp_mnt/usr/local/math/Packages/"}
```

```
<<Trigonometry.m  
<<VectorAnalysis.m  
etc.
```

Common Functions

```
Abs  
Erf  
Exp  
Sqrt  
Sign  
Log  
Prime
```

```
Mod  
N[Pi, 100]
```

Trigonometry

```
ArcCos  
ArcCosh  
ArcCot  
ArcSec  
ArcSin  
ArcSinh  
ArcTanh  
ArcTan  
Cos  
Cosh  
Coth  
Csc  
Csch  
Sec  
Sech  
Sin  
Sinh  
Tan  
Tanh
```

Constants

```
E  
Pi  
I
```