Mathematica - QUICK START

Spring semester 2017

http://www.phys.uconn.edu/~rozman/Courses/P2400_17S/

Last modified: May 4, 2017

1. Mathematica uses capitals for the first letter of its built-in functions, commands, options, etc. (and first letter of additional words that are part of built-in items). There are no spaces in the commands.

   Plot[...], Sin[...], Sqrt[...], N[...], Integrate[...]

2. To submit a command for processing in Mathematica, press Shift Enter

3. Natural log base e is E, imaginary unit i is I, π is Pi, and ∞ is Infinity.

4. Power: \( x^y \)

5. (a) Mathematica uses [] to enclose the argument of a function: Sin[x]

   (b) Mathematica uses {} to enclose the contents of a list:

   \[ \{x, 0, \text{Infinity}\}, \{\text{Sin}[t], \text{Cos}[t]\} \]

   (c) () are only used for grouping expressions: Sin[x/(x+3)]

   (d) [, ], {, ( must be used in pairs.

6. (a) N[expression] finds the decimal value of the expression.

   (b) NSolve[equation, {variables}] finds the roots of the equation:

   \[ \text{NSolve}[x + 2 == 5] \]

   Note: equations must have 2 equal signs.
(c) \texttt{NIntegrate[function[var],\{var, from, to\}]} evaluates the numerical value of the integral.

\texttt{NIntegrate[Sin[x],\{x, 0, Pi\}]}

7. Plot Command: \texttt{Plot[functions,\{x, xmin, xmax\}]}

\texttt{Plot[Sin[x],\{x, 0, 2Pi\}]} \quad \texttt{Plot[\{Sin[x], Cos[x]\},\{x, 0, 2Pi\}]}

8. You can define your own function with :=. The definition must include the underscore after the variable:

\texttt{addTwo[x_] := x + 2}

\texttt{Plot[addTwo[x],\{x, -1, 1\}]}

9. Integration: \texttt{Integrate[function[var],\{var, from, to\}]}

\texttt{fun[x_] := Integrate[Exp[-y^3],\{y, -x, x\}]}

\texttt{Plot[fun[x],\{x, 0, 3/2\}]}

10. Series expansion: \texttt{Series[function[var],\{var, var0, nterms\}]}

\texttt{res = Series[Sin[x]/(x + 2),\{x, 0, 4\}]}

\texttt{Truncate higher order terms:}

\texttt{Normal[res]}

11. Numerical solution of differential equations: \texttt{sol = NDSolve[\{y''[x]+y[x]+.1*y[x]^3 == 0, y[0]==1, y'[0]==0\}, y[x],\{x, 0, 20\}]}

\texttt{Plot[Evaluate[y[x] /. sol],\{x, 0, 20\}]}

12. Factorization: \texttt{Factor[-2/3 - x^3/3 + x]}