Mathematica - QUICK START

SPRING SEMESTER 2017

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

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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 — `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, Infinity}` `{Sin[t], 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`:

   ```
   NSolve[x + 2 == 5]
   ```

   Note: equations must have 2 equal signs.

(c) `NIntegrate[function[var],{var, from, to}]` evaluates the numerical value of the integral.

```
NIntegrate[Sin[x], {x, 0, Pi}]
```

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

```
Plot[Sin[x], {x, 0, 2Pi}]    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:

```
addTwo[x_] := x + 2

Plot[addTwo[x], {x, -1, 1}]
```

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

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

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

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

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

Truncate higher order terms:

```
Normal[res]
```

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

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

12. Factorization: `Factor[-2/3 - x^3/3 + x]`