Mathematica Quick Start for Math 13

1 Installing Mathematica

`https://caligari.dartmouth.edu/downloads/mathematica/`

2 Integration

All this is extracted from Mathematica's Help Menu, in particular their Function Navigator.

1. First consider functions of a single variable:
   (a) To compute $\int \sin(3x)\,dx$,
   (b) type `Integrate[Sin[3x],x]`
   and hit 'shift-enter' using the usual enter key, or the Enter key on the numeric keypad if your keyboard has one.
   (c) To compute $\int_0^{\pi/2} \sin(3x)\,dx$,
   (d) type `Integrate[Sin[3x],{x,0,Pi/2}]`
   and hit 'shift-enter'.
2. Next consider functions of two variables.
   (a) To compute $\int_0^2 \int_0^{y^2} \frac{1}{y^3+1}\,dx\,dy$,
   (b) type `Integrate[1/(y^3 + 1), {y, 0, 2}, {x, 0, y^2}]`
   (c) to compute the inner integral $\int_0^{y^2} \frac{1}{y^3+1}\,dx$,
   (d) type `Integrate[1/(y^3 + 1), {x, 0, y^2}]`
   (e) Note that integrating in the other order is not recommended:

$$\int \frac{1}{y^3+1}\,dy = \frac{\arctan[\frac{-1+2y}{\sqrt{3}}]}{\sqrt{3}} + \frac{1}{3}\log[1+y] - \frac{1}{6}\log[1-y+y^2]$$

   via partial fractions.

3 Graphing

1. Graphing a function $z = \sin(xy)$ over the rectangle $[-2, 2] \times [-4, 4]$ is easy:
2. Type `Plot3D[Sin[x*y], {x, -2, 2}, {y, -4, 4}]`
3. Two surfaces on the same set of axes:
4. `Plot3D[{36 - x^2 - y^2, x^2 + y^2}, {x, -4, 4}, {y, -4, 4}]`
5. A contour plot for when your surfaces are not functions of the same two variables, for example the cylinders $y = x^2$ and $z = y^2$.
6. `ContourPlot3D[{y - x^2 == 0, z - x^2 == 0}, {x, -3, 3}, {y, 0, 4}, {z, 0, 4}]`