

# First experiments with Mathematica

## 1 Get access

Mathematica is a mathematical software developed by Wolfram Research Company. Please see Page 4 of the [syllabus](#) for instructions on how to get access to Mathematica.

## 2 First experiments

- (1) Type `35/6`, then `Shift+Enter`.
- (2) Type `N[35/6]` (notice the square brackets), then `Shift+Enter`.
- (3) Type `Sqrt[2]` (notice the capitalized S), then `Shift+Enter`.
- (4) Type `N[%]`, then `Shift+Enter`.
- (5) Type `Sin[Pi]` (notice the capitalized S and P), then `Shift Enter`.
- (6) Type `34^100;` (with the semicolon), then `Shift Enter`.
- (7) Type `34^100` (without semicolon), then `Shift Enter`.

You may have noticed that the function `N` is to evaluate a numerical value of an expression. Each function's name is capitalized and used with square brackets (not with parentheses as we usually write). The semicolon is to hold the output. One uses it when output is too long or not of interest. Next, try the following:

- (8) `Exp[1]`, then `Shift+Enter`.
- (9) `Log[2]`, then `Shift+Enter`.
- (10) `f[x_] := Sin[x]+Cos[x]` (notice the dash after x), then `Shift+Enter`.
- (11) `f[Pi]+f[Pi/4]`, then `Shift+Enter`.
- (12) `Clear[f]`, then `Shift+Enter`.
- (13) `f[Pi]+f[Pi/4]`, then `Shift+Enter`.

The natural logarithm function is named `Log` in Mathematica (not `ln`). `Exp` is the exponential function. Command (10) is to define a function. The dash is required in order to tell Mathematica that we are defining the function  $f$ . The function `Clear` is to remove a defined variable from the memory.

## 3 Plot the graph of a function

First, let us plot functions of one variable, for example the sine function  $\sin(x)$ . Try the following commands:

- (14) `Plot[Sin[x], {x,0,2*Pi}]`, then `Shift+Enter`.
- (15) For decoration, try

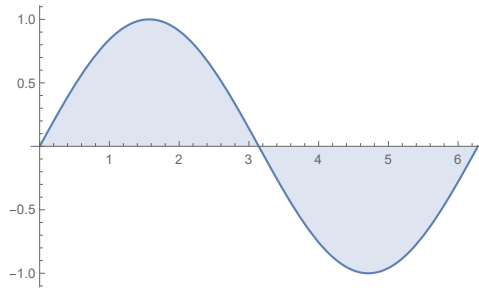


Figure 1

```
Plot[Sin[x], {x,0,2*Pi}, Filling->Axis]
```

Then **Shift+Enter**. Note that the arrow is typed as `->`.

(16) You can also give the function a name before plotting it. For example,

```
f[x_] := Sin[x]
Plot[f[x], {x,0,2*Pi}, Filling->Axis]
```

Then **Shift+Enter**. Note that the dash following  $x$  is no longer used after the definition of  $f$ .

Next, let us plot functions of two variables, for example

$$f(x, y) = x^2 \sin(y)$$

We will use the command **Plot3D** instead of **Plot**. Try the following commands:

(17) `Plot3D[x^2*Sin[y], {x,-2,2}, {y,-Pi,Pi}]`, then **Shift+Enter**.

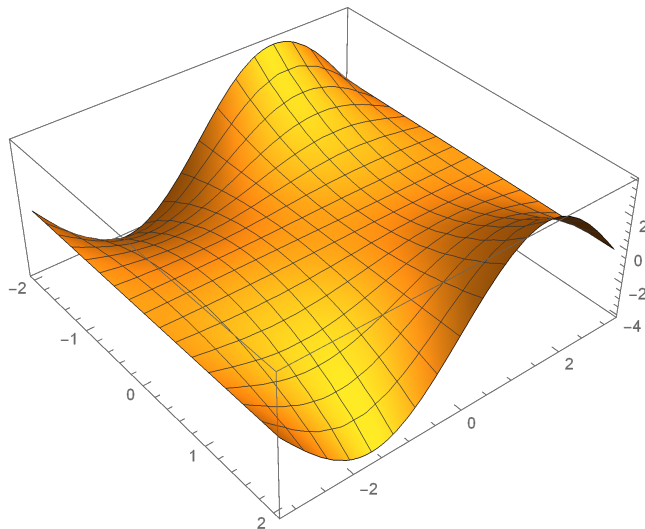


Figure 2: You can rotate the above surface with your mouse

(18) You can also give the function a name before plotting it. Try the following:

```
f[x_,y_] := x^2*Sin[y]
Plot[f[x,y], {x,-2,2}, {y,-Pi,Pi}]
```

There are many other interesting manipulation you can do on 3D graphs. Take a look at this [Wolfram's webpage](#).