
Semester II Reference Guide

Inputting Symbols

For most letters and symbols use: 'esc' letter 'esc' e.g.

```
€ (* 'esc' p 'esc' *)
```

```
π (* 'esc' p 'esc' *)
```

```
π
```

For mathematical symbols such as fractions use 'ctrl' + symbol, e.g.

```
 $\frac{\square}{\square}$  (* 'ctrl' + '/' *)
```

```
 $x^{\square}$  (* 'ctrl' + '6' *)
```

Sum & Table

Sum

```
Sum[f[n], {n, min, max}]
```

Example

```
Sum[Cos[n * x], {n, 1, 5}]
```

```
Cos[x] + Cos[2 x] + Cos[3 x] + Cos[4 x] + Cos[5 x]
```

Table

The Table command is very similar to the Sum command.

```
Table[f[n], {n, min, max}]
```

Example

```
Table[Cos[n * x], {n, 1, 5}]
{Cos[x], Cos[2 x], Cos[3 x], Cos[4 x], Cos[5 x]}
```

Alternative form of Table

There is an alternative form of the Table command that will be used later in the course. It can either be entered as:

```
Table[f[n], {n, {n1, n2, n3 ... nk}}
```

or by defining a list of values

```
list = {n1, n2, n3 ... nk}
```

and then typing the code as follows:

```
Table[f[n], {n, list}]
```

Examples

```
Table[Cos[n * x], {n, {1, 4, 5, 7}}]
{Cos[x], Cos[4 x], Cos[5 x], Cos[7 x]}
```

```
list1 = {1, 4, 5, 7}
{1, 4, 5, 7}
```

```
Table[Cos[n * x], {n, list1}]
{Cos[x], Cos[4 x], Cos[5 x], Cos[7 x]}
```

Piecewise Functions

A function of the form: $f(x) = \begin{cases} f_1(x) & a_1 < x < b_1 \\ f_2(x) & a_2 < x < b_2 \\ f_3(x) & \text{otherwise} \end{cases}$

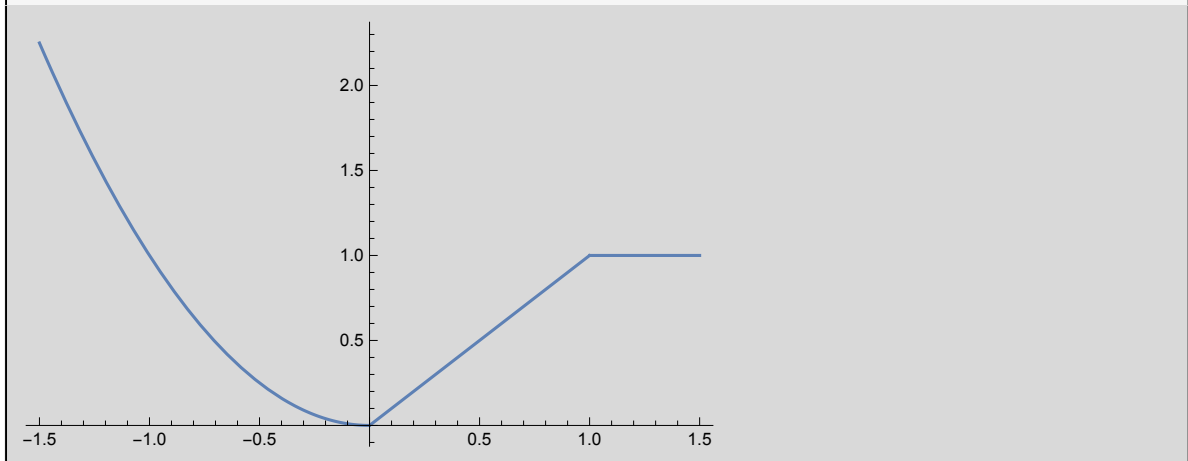
can be entered into Mathematica as follows:

```
Piecewise[{{f1[x], a1 < x < b1}, {f2[x], a2 < x < b2}}, f3[x]]
```

Example

```
f1[x_] := Piecewise[{{x^2, x < 0}, {x, 0 < x < 1}}, 1]
```

```
Plot[f1[x], {x, -1.5, 1.5}]
```



Simplify

The following command simplifies an expression:

```
Simplify[expression]
```

The following command simplifies an expression with the additional assumption that 'n' is an integer.

```
Simplify[expression, n ∈ Integers]
```

Be careful to type "Integers" correctly and not "Integer" or "integers".

Examples

```
Simplify[ $\frac{(\text{Sin}[x])^2 + (\text{Cos}[x])^2}{\text{Cot}[x]}$ ]
```

```
Tan[x]
```

```
Simplify[Sin[2 * π * n], n ∈ Integers]
```

```
0
```

ListPlot

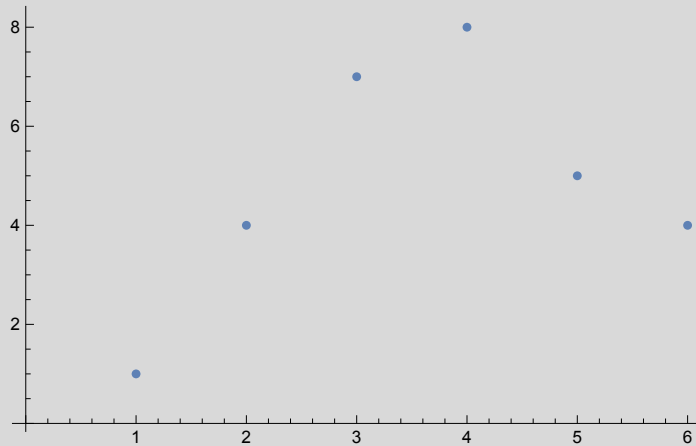
```
ListPlot[listname]
```

Example

```
list2 = {1, 4, 7, 8, 5, 4}
```

```
{1, 4, 7, 8, 5, 4}
```

```
ListPlot[list2]
```

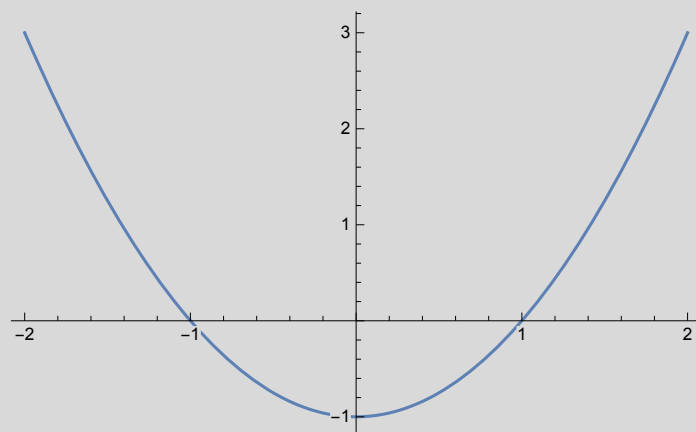


FindRoot

```
FindRoot[f[x], {x, guess}]
```

Example

```
Plot[x2 - 1, {x, -2, 2}]
```



```
FindRoot[x2 - 1, {x, 1.5}]
```

```
{x → 1.}
```

```
FindRoot[x2 - 1, {x, -0.3}]
{x → -1.}
```

ReplaceAll

This command can be used to change an instruction of the form {x->3} into 3.

```
ReplaceAll[x, {x → value}]
```

Examples

The code can either be entered as:

```
In[33]:= ReplaceAll[x, {x → 3}]
```

```
Out[33]= 3
```

Or we can define the instruction separately as so:

```
In[34]:= list3 = {x → 3}
```

```
Out[34]= {x → 3}
```

```
In[35]:= ReplaceAll[x, list3]
```

```
Out[35]= 3
```