Week 7 - Defining Functions

Review

>Differentiate using Dt[function, variable]

> Dt[function, {variable, n times}]

> Press equals twice '= =' to search for just about anything

Defining a function

Am exaple of a function is f(x) $= x^2$. Typically we will define in the following way:

```
f[x_] := x^2
```

Comparing ways of defining a function:

Method 1:

```
Func1[x_] := Dt[x^2, x]
```

```
Func1[3]
```

General::ivar : 3 is not a valid variable. >>

```
Dt[9, 3]
```

Method 2:

```
Func2[x_] = Dt[x^2, x]
```

```
2 x
```

```
Func2[3]
```

```
6
```

Method 3:

```
Func3 = Dt[x^2, x]
```

```
2 x
```

```
Func3
```

```
2 x
```

Letters Turn Green for 'Dotted' Function on LHS and RHS

g1(x)=x+x^2

```
g1[var_] := var + var^2
```

```
g1[x]
```

$x + x^2$

```
g1[y]
```

$y + y^2$

```
g1[physics]
```

```
g1[2]
```

6

Letters Turn Green for ‘Non-dotted’ Function only on LHS

```
g2[var_] = var + var^2
```

Built-in Functions

There are many built-in functions in *Mathematica*. An example of one that we have seen before is Sin.

```
Sin[x]
```

Sin[x]

```
Sin[y]
```

Sin[y]

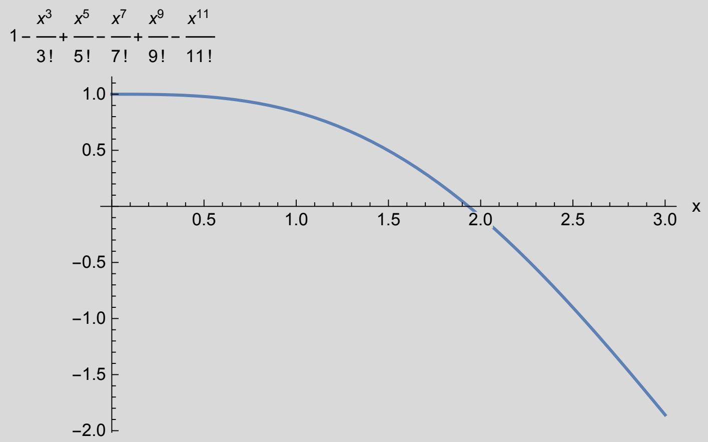
```
Sin[3.14]
```

0.00159265

Keeping our Code Tidy

Terms of Taylor Expansion $1 - \frac{x^3}{3!} + \frac{x^5}{5!} - \frac{x^7}{7!} + \frac{x^9}{9!} - \frac{x^{11}}{11!}$

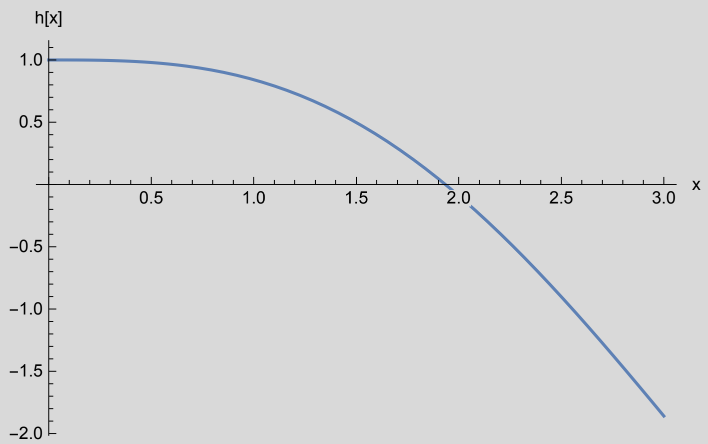
$$\text{Plot}\left[1-\frac{x^3}{3!}+\frac{x^5}{5!}-\frac{x^7}{7!}+\frac{x^9}{9!}-\frac{x^{11}}{11!},\ \{x,0,3\},\ \text{AxesLabel}\to\left\{\text{"x"},\ \text{"}1-\frac{x^3}{3!}+\frac{x^5}{5!}-\frac{x^7}{7!}+\frac{x^9}{9!}-\frac{x^{11}}{11!}\text{"}\right\}\right]$$



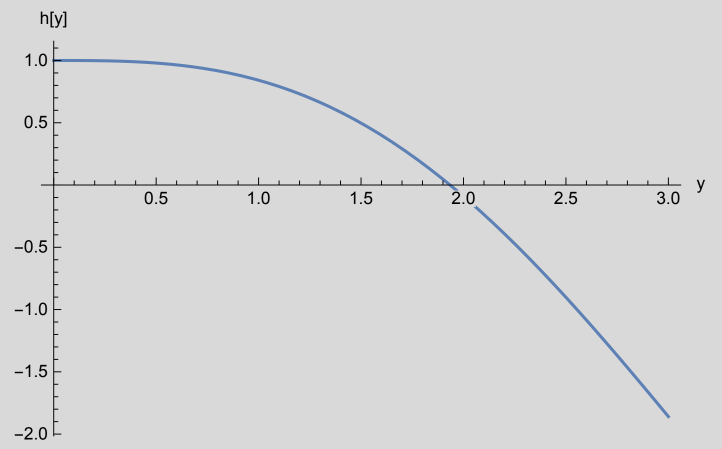
Or Define function first:

$$\text{h[x\_]} := 1-\frac{x^3}{3!}+\frac{x^5}{5!}-\frac{x^7}{7!}+\frac{x^9}{9!}-\frac{x^{11}}{11!}$$

```
Plot[h[x], {x, 0, 3}, AxesLabel → {"x", "h[x]"}]
```



```
Plot[h[y], {y, 0, 3}, AxesLabel → {"y", "h[y]"}]
```



Summary

> Dots-Delay evaluation of function; no Dots - evaluates function and replaces input value into the output of the already evaluated function.
> You can define a function by Name[variable_]:=(something dependent on ‘variable’).
> Green text on the RHS indicates what is being replaced before the evaluation of the RHS takes place.
> Functions are a good way of organising code into manageable pieces.