Introduction to *Mathematica*: Getting Started

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This notebook is to help introduce you to *Mathematica*. *Mathematica* is a very power program that allows one to do computations both numerically and analytically. The problem with *Mathematica* is that it has a steep learning curve.

Let's do something simple to start.

```
2 + 2
```

```
4
```

To run the command "2+2" type shift-Return or hit the Enter key on the keypad. You should see a bracket that says in and out.

Now, lets define a list of numbers. Everything in *Mathematica* is a list and command. I define a list using {}.

```
a = {1, 5, 7, 4, 5, 6, 3, -1, 4, 0, 5}
```

```
{1, 5, 7, 4, 5, 6, 3, -1, 4, 0, 5}
```

I can get individual elements from the list using [[ ]]

```
a[[3]]
```

```
7
```

The number 7 is the 3rd element in the list. Lets do a command called "Length". To see what it does, I type ? Length

```
? Length
```

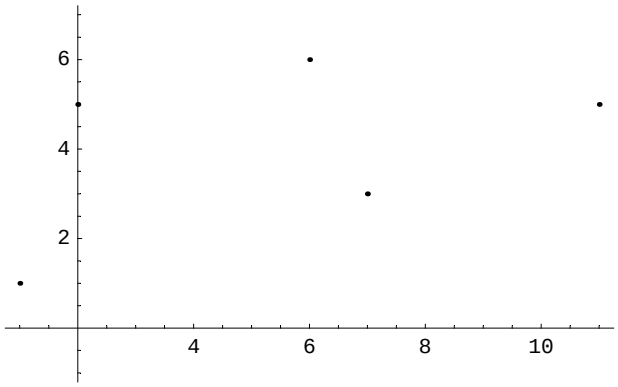
```
Length[expr] gives the number of elements in expr. More...
```

```
Length[a]
```

```
11
```

This command tells me how many elements are in my list. Let's plot the elements of the list. *Mathematica* plotting looks poor so we will need to add some graphic commands later.

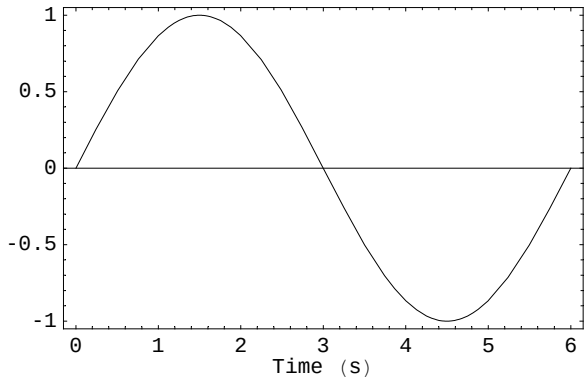
```
ListPlot[a]
```




```
- Graphics -
```

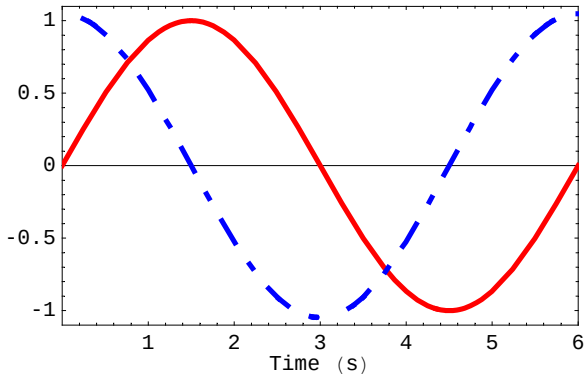
We can also define function in Mathematica as well. Define f(t)=Sin[x];

```
f[t_] = Sin[2 π / 6 t];
Plot[f[t], {t, 0, 6}, Frame → True,
  PlotRange -> {All, All}, FrameLabel -> {"Time (s)", " "}];
```



I can find the derivative of this function and plot it with the function.

```
df[t_] = f'[t];
Plot[{f[t], df[t]}, {t, 0, 6}, Frame → True, PlotRange -> {{0, 6}, All},
  FrameLabel -> {"Time (s)", " "}, PlotStyle → {{RGBColor[1, 0, 0], Thickness[0.01]},
    {RGBColor[0, 0, 1], Dashing[{0.01, 0.05, 0.05, 0.05}], Thickness[0.01]}}];
```



Instead of making a function, I can make a list of ordered pairs instead using the Table command.

```
data = Table[{j , Sin[j  2 π / 6]}, {j, 0, 6, 0.05}];
ListPlot[data, PlotRange -> {{0, 6}, All},
  Frame → True, PlotJoined → True, FrameLabel -> {"Time (s)", " "}];
```