Mathematica (8)

Mathematica can do many of the practice problems that we have just discussed. To expand the ArcTanh[x] in a power series in x and to compare this series to the power series for ArcTan[x] we do the following:

```
In[1]:= Series[ ArcTanh[x], {x, 0, 7}]
```

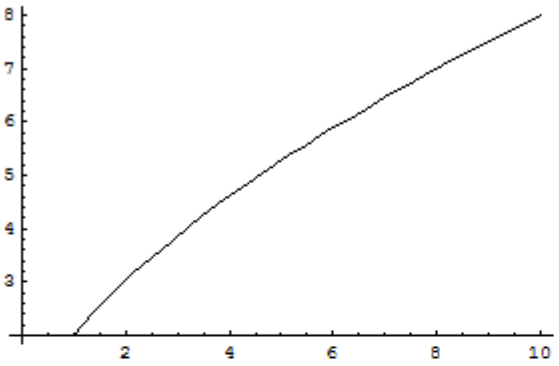
$$\text{Out[1]= } x + \frac{x^3}{3} + \frac{x^5}{5} + \frac{x^7}{7} + O[x]^8$$

```
In[2]:= Series[ArcTan[x], {x, 0, 7}]
```

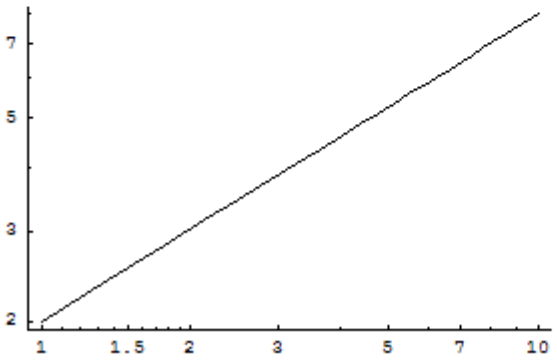
$$\text{Out[2]= } x - \frac{x^3}{3} + \frac{x^5}{5} - \frac{x^7}{7} + O[x]^8$$

To plot the function $y = Ax^n$ on linear and log-log plots we proceed as follows:

```
In[3]:= << Graphics`Graphics`
In[4]:= Plot[ 2 x^(Log[10, 4]), {x, 1, 10}]
```




```
Out[4]= - Graphics -
In[5]:= LogLogPlot[ 2 x^(Log[10, 4]), {x, 1, 10}]
```




```
Out[5]= - Graphics -
```

Note the statement <<Graphics`Graphics` which is required to load in the LogLogPlot. Also, Log[10, 4] is $\log_{10} 4$. The first number in the Log argument is the base, and the second number is the quantity for which you want the log.

We can also use Mathematica to solve other problems we have discussed in class. Below are Mathematica solutions for two other problems we have considered.

```
In[6]:= Solve[ x^3 + 27 I == 0]
```

$$\text{Out[6]= } \left\{\{x \to 3\,i\}, \left\{x \to \frac{3}{2}\left(-i - \sqrt{3}\right)\right\}, \left\{x \to \frac{3}{2}\left(-i + \sqrt{3}\right)\right\}\right\}$$

```
In[7]:= ComplexExpand[ (3 + 2 I) / (1 - I)]
```

$$\text{Out[7]= } \frac{1}{2} + \frac{5\,i}{2}$$