**Power / Taylor Series**

*Part 2: By Substitution and Basic Algebra*

We now have a few basic power series at our disposal:

* Geometric series: for
* Exponential series: for all x
* Series for sine: for all x
* Series for cosine: for all x

From these we can figure out additional series by simple substitution.

Find a series expansion for .

Find a series expansion for

We know that . Then

We can of course combine substitution with integration and/or differentiation:

Find the series expansion for

We can go about this in two different ways. Method 1 starts by substituting in the series expansion for , then multiplying everything by :

Alternatively, we could write and start with the series expansion for :

Either way, the answer is the same.

**Exercises:**

1. Find the series expansion for and
2. Use a series computed above to prove that Note that it is interesting that the complicated transcendental number \pi is a sum of 1 over plus/minus the odd integers. However, the rate of convergence is rather slow; try to approximate to, say, 4 digits