

SERIES DAY 9
POWER SERIES CONTINUED

Representation of Functions by Power Series

There are several techniques for finding a power series to represent a given function:

- 1) Recognizing it as the sum of a geometric power series
- 2) Adding or subtracting two power series
- 3) Multiplying or dividing a power series by a variable and/or constant
- 4) Differentiating or integrating a power series
- 5) Substituting into a known series

First we'll do a quick review of geometric series. Geometric series are formed by multiplying by a common ratio r . Suppose I told you to start with $a_1 = 2$ and to let $r = 3$, what geometric series would you write?

What if $a_1 = 2$ and $r = -3$?

What if $a_1 = 1$ and $r = x$?

Ex. Find a power series for $f(x) = \frac{1}{1-x^2}$, centered at $x = 0$. Find the first four nonzero terms and the general term.

Ex. Find a power series for $g(x) = \frac{1}{4+x}$, centered at $x = 0$. Find the first four nonzero terms and the general term.

Ex. Find a power series for $h(x) = \frac{15}{2x-1}$, centered at $x = 2$. Find the first four nonzero terms and the general term.