1 10.5: Power Series

Definition: A **power series** is

Goal: Given a power series, determine the values of x for which the series is convergent (Known as the **interval of convergence**)

Result:

Examples:

Find the interval of convergence for $\sum_{n=0}^{\infty} x^n$.

When finding the interval of convergence of a power series, there are 3 possible results:

1. $\sum_{n=0}^{\infty} c_n(x-a)^n$ converges only when
2. $\sum_{n=0}^{\infty} c_n(x-a)^n$ converges for
3. $\sum_{n=0}^{\infty} c_n(x-a)^n$ converges on

Definition: The **radius of convergence** of a power series

Find the radius and interval of convergence of $\sum_{n=0}^{\infty} n!x^n$

Find the radius and interval of convergence of $\sum_{n=0}^{\infty} \frac{x^{2n+1}}{(2n+1)!}$

Find the radius and interval of convergence of $\sum_{n=0}^{\infty} \frac{(x-2)^n}{\sqrt{n+1}\,6^n}$

Find the radius and interval of convergence of $\displaystyle\sum_{n=0}^{\infty} \frac{(3n-2)^n}{n^2+4}$

On Beyond Average:

If the series $\displaystyle\sum_{n=1}^{\infty} c_n(x-6)^n$ has radius of convergence $r=3$, find the values of x for which we know the series is convergent.

The radius of convergence of the series $\displaystyle\sum_{n=1}^{\infty} \frac{3^n(x-1)^n}{n+4}$ is $\frac{1}{3}$. Find the interval of convergence.