

MATH 153

Today

1. Go over exam (Briefly)
2. 8.5 Power Series

Goals:

1. 8.5 Power Series (Understand the definition of a power series and how to find its radius and interval of convergence)

Where is today's material used?

1. Power series are frequently used to approximate more complicated functions in physics and chemistry.
2. Power series techniques are used to solve certain differential equations.

8.5 Power Series

1. **Definition:** A **power series centered at a** is a series of the form

$$\sum_{n=0}^{\infty} c_n(x - a)^n, \text{ where } x \text{ is a variable.}$$

2. A power series is a function of x with domain $\{x \in \mathbb{R} : \sum_{n=0}^{\infty} c_n(x - a)^n \text{ converges}\}$.

3. **Theorem:** Let $\sum_{n=0}^{\infty} c_n(x - a)^n$ be a power series about a . There are three possibilities:

- (a) The series only converges at $x = a$
- (b) The series converges for all $x \in \mathbb{R}$

- (c) There is a number $R > 0$ such that the series converges if $|x - a| < R$ and diverges if $|x - a| > R$.

In the third case, the number R is the **radius of convergence**. For (a) and (b), we put $R = 0$ or $R = \infty$, respectively.

4. **Definition:** The **interval of convergence** of a series is the set of values x for which the series converges. By the above, this is of the form $(a - R, a + R)$, $[a - R, a + R)$, $(a - R, a + R]$, or $[a - R, a + R]$.
5. Examples: 8.5, p. 468: 3-22.

Next Time

1. 8.6: Representing functions as power series.
2. **Turn in** 8.5 WeBWorK Set 11: 3, 4, 6