

10.7 Power Series

Main Ideas

- **Power Series**

are series in the form

$$\sum_{n=0}^{\infty} c_n x^n = c_0 + c_1 x + c_2 x^2 + c_3 x^3 + \dots$$

a power series about (centered at) $x = a$ is in the form

$$\sum_{n=0}^{\infty} c_n (x - a)^n = c_0 + c_1 (x - a) + c_2 (x - a)^2 + c_3 (x - a)^3 + \dots$$

- **Convergence Theorem for Power Series**

1. If the power series

$$\sum_{n=0}^{\infty} c_n x^n = c_0 + c_1 x + c_2 x^2 + c_3 x^3 + \dots$$

converges at $x = c \neq 0$, then it converges for all $|x| < c$

2. If it diverges for some $x = d$, then it diverges for all $|x| > |d|$

- **Testing for Convergence**

1. Use the ratio test or the root test to find the interval of convergence

$$|x - a| < R$$

2. If R is finite, test the endpoints for convergence
3. If R is finite, the series diverges for all $|x - a| > R$