10.8 Taylor and Maclaurin Series

Main Ideas

- **Taylor Series**

  If f is a function with derivatives of all orders throughout some interval containing a, then the Taylor series generated by f at $x = a$ is

  $$\sum_{n=0}^{\infty} \frac{f^{(n)}(a)}{n!}(x-a)^n \quad = \quad f(a) + f'(a)(x-a) + \frac{f''(a)}{2!}(x-a)^2 + \frac{f^{(3)}(a)}{3!}(x-a)^3 + ...$$

  where $f^{(n)}(x)$ is the n-th derivative of $f(x)$

- **Maclaurin Series** The Maclaurin series of f is the Taylor series of f at $a = 0$

- A **Taylor Polynomial of Order** n is the polynomial generated by the first n terms of the Taylor series