Rutgers University
Math 152

Section 10.9: Convergence of Taylor Series - Worksheet

1. Use the Remainder Estimation Theorem to estimate the error made when approximating $f(x) = \sqrt{1 + 3x}$ by its 2nd degree Maclaurin polynomial $T_2(x)$ on the interval $[0, 0.1]$.

2. Consider the function $f(x) = \dfrac{1}{1 + 2x}$.

   (a) Find the Maclaurin series of f using geometric series. What are its radius and interval of convergence?

   (b) Find the Maclaurin series of f using its definition. (Hint: compute the first few derivatives of f and identify a pattern to find a formula for $f^{(n)}(x)$.)

   (c) Find is the smallest integer N for which the Maclaurin polynomial $T_N(x)$ of $f(x)$ approximates $f(x)$ with an error of at most 10^{-4} on the the interval $[-0.1, 0.1]$.

3. Find the Maclaurin series of the following functions.

   (a) $f(x) = x^4 \ln(1 - 5x^3)$.

   (b) $f(x) = e^{-x^2/2} - \cos(x)$.

4. Find the first three non-zero terms of the Maclaurin series of $\sin(2x)e^{3x}$.