Rutgers University
Math 152

**Section 10.10: Applications of Taylor Series - Worksheet**

1. Use Maclaurin series to compute the following limits.

   (a) $\displaystyle\lim_{x\to 0} \frac{e^{-2x^2} - \cos(2x)}{x^2 \ln(1+5x) - 5x^3}$.

   (b) $\displaystyle\lim_{x\to\infty} x^3 \left(\tan^{-1}\left(\frac{4}{x}\right) - 2\sin\left(\frac{2}{x}\right)\right)$.

   (c) $\displaystyle\lim_{x\to 0} \frac{\sin(x^6)}{\cos(x^3) - 1}$.

   (d) $\displaystyle\lim_{x\to\infty} x^2 \left(5\ln\left(1+\frac{3}{x}\right) - 3\ln\left(1+\frac{5}{x}\right)\right)$.

2. Use Maclaurin series to write each integral below as the sum of an infinite series of numbers (your series should not contain $x$).

   (a) $\displaystyle\int_0^{1/2} \cos(5x^2)dx$.

   (b) $\displaystyle\int_0^1 x^3 e^{-4x^3} dx$.

   (c) $\displaystyle\int_0^{1/3} x^7 \sin(2x^5)dx$.

3. (a) Use Maclaurin series to write the integral $I = \displaystyle\int_0^1 e^{-x^2} dx$ as the sum of an infinite series of numbers.

   (b) Use the Alternating Series Estimation Theorem to find how many terms of the series found in (a) need to be summed in order to obtain an approximation of $I$ with an error of less than $10^{-5}$.