The University of Western Ontario (Western University)

Calculus 1501B, Winter 2014 Homework assignment 4 (24 marks total).

Due on Monday April 7, in class.

Problem 1. (4 marks) Find a power series representation for

$$f(x) = \frac{x-5}{3x^2+5x-2}$$

Determine the interval of convergence. [Hint: use partial fractions.]

Problem 2. (4 marks) Find a power series representation for

$$f(x) = \frac{x^5}{(1-3x)^2}$$

Determine the radius of convergence. [*Hint: antidifferentiate* $\frac{1}{(1-3x)^2}$]

Problem 3. (4 marks) Find the Maclaurin series for $f(x) = e^{2x} + \ln(1-x)$.

Problem 4. (4 marks) Find the Taylor series centered at 5 for $f(x) = \ln x$. **Problem 5.** (4 marks)

$$\sum_{n=0}^{\infty} (-1)^n \frac{\pi^{2n+1}}{(2n+1)! \ 4^{2n+1}} = -\frac{(\ln 2)^3}{3} + \frac{(\ln 2)^5}{5} - \frac{(\ln 2)^7}{7} + \frac{(\ln 2)^9}{9} - \dots =$$

Problem 6. (4 marks) Approximate $f(x) = x \cos x$ by a Taylor polynomial of degree 5 at a = 0. Use Taylor's inequality to estimate the accuracy of the approximation $f(x) \approx T_5(x)$ when $-0.5 \le x \le 0.5$ (i.e. you are supposed to give an upper bound for $|R_5(x)|$ on [-0.5, 0.5], where $R_5(x) = f(x) - T_5(x)$).