Mathematics 1120H – Calculus II: Integrals and Series
TRENT UNIVERSITY, Winter 2020

Assignment #5
A Little Series Calculus
Due on Friday, 24 July.

Please submit your solutions using Blackboard's assignment module. If that fails, please email your solutions to the instructor (`sbilaniuk@trentu.ca`*). Scans or photos of handwritten solutions are perfectly acceptable, so long as they are legible and in some common format. (Combined into a single pdf, for preference.)*

1. Find a nice formula for the sum of the series

$$\sum_{n=0}^{\infty}(-1)^n x^n = 1 - x + x^2 - x^3 + x^4 - x^5 + \cdots$$

and determine for which values of x this series converges. *[1]*

2. Find a nice formula for the sum of the series

$$\sum_{n=0}^{\infty}(-1)^n n x^{n-1} = 0 - 1 + 2x - 3x^2 + 4x^3 - 5x^4 + \cdots$$

and determine for which values of x the series converges. *[2]*

3. Find a nice formula for the sum of the series

$$\sum_{n=0}^{\infty}\frac{(-1)^n x^{n+1}}{n+1} = x - \frac{x^2}{2} + \frac{x^3}{3} - \frac{x^4}{4} + \frac{x^5}{5} - \frac{x^6}{6} + \cdots$$

and determine for which values of x this series converges. *[3]*

4. Find the sum of the alternating harmonic series $\displaystyle\sum_{n=1}^{\infty}\frac{(-1)^{n+1}}{n}$. How many terms of this series do you need to add up to guarantee that the partial sum in question is within $0.0001 = 10^{-4} = \frac{1}{10000}$ of the sum of the entire series? *[4]*