

Mathematics 1120H – Calculus II: Integrals and Series

TRENT UNIVERSITY, Winter 2024

Assignment #11

Series of Power II: Taylor's Formula vs. Algebra

Due* just before midnight on Friday, 5 April.

Please do all three of the following problems by hand. No SageMath this time, except maybe to check your answers.

1. For what values of x does the series $\sum_{n=0}^{\infty} (-1)^n (n+1)x^n$ converge? [3]

2. Use Taylor's Formula to show that $\frac{1}{(1+x)^2} = \sum_{n=0}^{\infty} (-1)^n (n+1)x^n$ when the series converges. [4]

3. Use algebra to show that $\frac{1}{(1+x)^2} = \sum_{n=0}^{\infty} (-1)^n (n+1)x^n$ when the series converges. [3]

Hint: $\frac{1}{1+x} = \frac{1}{1-(-x)}$ is the sum of the geometric series $\sum_{n=0}^{\infty} (-1)^n x^n = 1 - x + x^2 - x^3 + \dots$ when that series converges.

Another mathematics nursery rhyme:

Little Jack Horner
Sat in the corner
trying to work out π .
He said 'It's minus the logarithm
Of minus one to the i .'

Also from *Seven Years of Manifold 1968-1980*.

* You should submit your solutions via Blackboard's Assignments module, preferably as a single pdf. If submission via Blackboard fails, please submit your work to your instructor by email or on paper.