

Written HW17 – MATH 2502 Fall 2021

Due by 20 October for timely completion credit

In these problems, you will be given a convergent series, but these series do not have “nice” closed form values. Recall that $S_N = \sum_{k=1}^N a_k$ is a partial sum, and we define the remainder $R_N = \sum_{k=N+1}^{\infty} a_k$. If $f(k) = a_k$, then we know that

$$\int_{N+1}^{\infty} f(x)dx < R_N < \int_N^{\infty} f(x)dx. \quad (1)$$

For each of these series, compute the estimate (1) and use it to find a value of N such that $R_N < \epsilon$ for the given value of ϵ . Once you find that value of N , use Excel or WolframAlpha to compute the partial sum S_N and report that value.

1. $\sum_{k=2}^{\infty} \frac{1}{k \ln(k)^2}$; $\epsilon = 0.1$
2. What N would be needed to estimate the previous series to an accuracy of $\epsilon = 0.001$? Do not try to compute this partial sum!
3. $\sum_{k=0}^{\infty} \frac{k}{e^k}$; $\epsilon = 0.001$ (*hint: integration by parts will be useful here; you will not be able to solve the resulting inequality for N , so plot and find it visually as was done for a problem in class!*)