Written HW11 – MATH 2502 Spring 2021

Due by 29 March 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 $S_N = \sum^N a_k$ is a partial sum, and we define the remainder $R_N = \sum_{k=N+1}^{\infty}$. If $f(k) = a_k$, then we know that

$$\int_{N+1}^{\infty} f(x)\mathrm{d}x < R_N < \int_{N}^{\infty} f(x)\mathrm{d}x. \tag{1}$$

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. $\displaystyle\sum_{k=2}^{\infty} \frac{1}{k\ln(k)^2}$; $\epsilon = 0.1$
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. $\displaystyle\sum_{k=0}^{\infty} \frac{k}{e^k}$; $\epsilon = 0.001$ (*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!*)