1. (5 points) Determine whether the series is convergent or divergent.

\[ \sum_{n=2}^{\infty} \frac{1}{n \ln n} \]  

This series is \underline{divergent} by the \underline{Integral test} due to the argument below:

\( f(x) = \frac{1}{x \ln x} \) is \underline{decreasing} (because the denominator gets larger as \( x \) increases), \underline{positive} and \underline{continuous} on \([2, \infty)\). Hence the \underline{Integral test} applies.

Now,

\[ \lim_{a \to \infty} \int_{2}^{a} \frac{1}{x \ln x} \, dx \]

\[ = \lim_{a \to \infty} \int_{\ln 2}^{\ln a} \frac{1}{u} \, du \]

\[ = \lim_{a \to \infty} [\ln |u|]_{\ln 2}^{\ln a} \]

\[ = \lim_{a \to \infty} [\ln |\ln a| - \ln |\ln 2|] \]

\[ = \infty \]

\[ \int_{2}^{\infty} \frac{1}{x \ln x} \, dx \] is \underline{divergent}, which implies

Thus, the given series is \underline{divergent} by the \underline{Integral test}.