

## Section: 163

Name &amp; Surname: \_\_\_\_\_

Math 120 Spring 2017-2018

Quiz no.: 01

ID Number: \_\_\_\_\_

Date: 02.03.18

Time Limit: ~15 Minutes

Grade: \_\_\_\_\_

1. If exists, determine the sum of the infinite series  $\sum_{n=0}^{\infty} \ln\left(\frac{n+3}{n+2}\right)$ .

Rearrange the series as follows:

$$\sum_{n=0}^{\infty} \ln\left(\frac{n+3}{n+2}\right) = \sum_{n=0}^{\infty} [\ln(n+3) - \ln(n+2)]$$

The sequence of partial sum is defined as

$$\begin{aligned} S_n &= \sum_{i=0}^n [\ln(i+3) - \ln(i+2)] = \cancel{\ln 3} - \ln 2 + \cancel{\ln 4} - \cancel{\ln 3} + \cancel{\ln 5} - \cancel{\ln 4} + \dots + \ln(n+3) - \cancel{\ln(n+2)} \\ &= \ln(n+3) - \ln 2 \end{aligned}$$

The series converges to the limit of its sequence of partial sums

$$\lim_{n \rightarrow \infty} S_n = \lim_{n \rightarrow \infty} [\ln(n+3) - \ln 2] = \infty$$

Since this limit is divergent;  $\sum_{n=0}^{\infty} \ln\left(\frac{n+3}{n+2}\right)$  diverges to  $\infty$ .