Read each question carefully and be sure to SHOW ALL WORK. Correct answer without proper justification will not receive a "Complete" grade. Paç fat! Good luck!

Name: ______________________________

LO 6. Series [CORE]. I can extract information about series and their corresponding sequences of partial sums.

Criteria for Success: I can

- convert a series between expanded notation and sigma notation
- determine the sequence of partial sums for a given series
- find exact formulas for sequences of partial sums of arithmetic, geometric, and telescoping series
- determine the sum of a series from the definition as the limit of its partial sum
- use the formulas for both the finite and infinite sum of geometric or telescoping series

Question: Consider the series $\displaystyle\sum_{k=1}^{\infty}\left(\frac{k^2}{k+1}-\frac{(k+1)^2}{k+2}\right)$.

(a) Write the series in expanded notation.

(b) Find the sum $S_{100} = \displaystyle\sum_{k=1}^{100}\left(\frac{k^2}{k+1}-\frac{(k+1)^2}{k+2}\right)$ of its first 100 terms (i.e., the 100-th partial sum), and then find an exact formula for the N-th partial sum for any whole number N. **Hint:** The two formulas should match when $N = 100$.

$S_{100} =$ Exact Formula:

(c) Use the exact formula to determine if the series converges or diverges directly from the limit definition, without using any tests of convergence/diveregence. If it converges, find the value it converges to.

LO 7. Series Tests [CORE]. I can determine convergence or divergence of a series by selecting an appropriate convergence test and applying it.

Criteria for Success: I can

- select and apply an appropriate convergence test: nth-term (divergence), geometric series, integral, comparison, limit comparison, p-series, alternating series, ratio, root, or absolute convergence
- distinguish between an absolutely convergent, conditionally convergent, or divergent series.

Question: Clearly state the name of the convergence/divergence tests you're using, and check that their conditions are satisfied. The series $\sum_{k=1}^{\infty}(-1)^k \frac{\ln(k) - 1}{k}$ is

(a) absolutely convergent

(b) conditionally convergent

(c) divergent.

You may assume that $\frac{\ln(x) - 1}{x}$ is positive and decreasing for $x \geq 8$. **Hint:** Conditions of tests you apply just need to be eventually true, i.e., meaning for all x greater than a fixed number like 8 for instance.