

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

Name: \_\_\_\_\_

**LO 8. Series Approximation.** I can use partial sums to estimate the sum of a convergent series, and find error bounds where appropriate.

**Criteria for Success:** I can

- estimate the sum of a convergent series
- find error bounds using integrals
- find error bounds of alternating series
- determine how many terms must be used in order to have an approximation with an error no greater than a given value

**Question:** Consider the series  $\sum_{k=2}^{\infty} (-1)^k \frac{1}{3^k + 1}$ .

- (a) Using appropriate methods for error estimation, find the error when approximating the series with the partial sum  $\sum_{k=2}^{10} (-1)^k \frac{1}{3^k + 1}$ . Determine up to how many decimals this approximation is guaranteed to be accurate. Include a brief explanation of the conditions of the theorem you use.
- (b) Find an approximation of this series to within 0.001 accuracy. Outline the steps you take to determine the number of terms needed for this accuracy, starting with a general expression for the error bound.
- (c) Provide a brief explanation of a real-world scenario where estimating the sum of a series with an error bound is important. Discuss why precise error estimation is crucial in this context.