

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

## Assessment 5

### Math& 264: Multivariable Calculus

Instructions: Please carefully complete these questions by hand. Be sure to show all work including sketching relevant graphs and providing exact answers.

Should you choose to work these on scratch paper, please do not put more than one question on a page. Additional sheets of paper are acceptable.

Upload your solutions to Gradescope by 9 am on Monday (5/11). During your presentation time, you will be asked to explain your thought process and reasoning on one randomly assigned question. Late solutions are available thru noon with a 2 point penalty (smaller penalties if you can document that this is a revision and only minor changes).

Please make sure to sign up for your presentation slot. If you are unavailable for any of the times available, please send me a note in Slack and we will find a time that works for you.

<https://docs.google.com/spreadsheets/d/1IGUR3J5qnXkbLUhWWeoMjbxYb1peN9lt5gZYj7wAtCo/edit?usp=sharing>

It is Mother's Day weekend. Choose one question to skip and just put "Mother's Day" as your answer. If you happen to be a mother, choose two questions to skip.

(1.1) Does the series  $\sum_{k=1}^{\infty} \frac{k}{e^k}$  converge or diverge? Justify your answer and be sure to state a clear and logical conclusion.

(1.2) Consider the series  $\sum_{k=1}^{\infty} \frac{1}{3^k}$ . Find how many terms are needed to ensure that the remainder is less than  $10^{-3}$ . Find an interval in which the value of the series must lie if you approximate it using the first 10 terms of the series.

(1.3) Does the series  $\sum_{k=3}^{\infty} \frac{4}{k\sqrt{\ln k}}$  converge or diverge? Justify your answer and be sure to state a clear and logical conclusion.

(1.4) Does the series  $\sum_{k=1}^{\infty} \frac{k^2 + 2k + 1}{3k^2 + 1}$  converge or diverge? Justify your answer and be sure to state a clear and logical conclusion.

(1.5) Does the series  $\sum_{k=1}^{\infty} \frac{k^8}{k^{11} - 3}$  converge or diverge? Justify your answer and be sure to state a clear and logical conclusion.

(1.6) Does the series  $\frac{1}{2^2} + \frac{2}{3^2} + \frac{3}{4^2} + \dots$  converge or diverge? Justify your answer and be sure to state a clear and logical conclusion.

(1.7) Does the series  $\sum_{k=3}^{\infty} \frac{1}{\ln k}$  converge or diverge? Justify your answer and be sure to state a clear and logical conclusion.

(1.8) How many terms of the series  $\frac{1}{e} = \sum_{k=0}^{\infty} \frac{(-1)^k}{k!}$  must be summed to be sure that the remainder is less than  $10^{-4}$  in magnitude? Justify your answer using the methods developed in the course.

(1.9) Estimate the value of the series  $\sum_{k=1}^{\infty} \frac{(-1)^k}{k^5}$  with an error that has absolute value less than  $10^{-3}$ .

(1.10) Determine whether the series  $\sum_{k=1}^{\infty} \frac{\cos k}{k^3}$  converges absolutely, converges conditionally, or diverges.