

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

## Assessment 6

### 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 (5/18). 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 2 pm 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/1IGUR3J5qnXkbLUhWWeoMjbxYb1peN9It5gZYj7wAtCo/edit?usp=sharing>

(1.1) Find the gradient field  $\vec{F} = \nabla \varphi$  for the potential function  $\varphi = 5x + 4y$  for  $|x| \leq 10$  and  $|y| \leq 10$ .

Sketch a few level curves of  $\varphi$  and a few vectors of  $\vec{F}$ .

(1.2) Consider the potential function  $\varphi(x, y) = e^{x-y}$ . Pick a point and show that the level curves and gradient are orthogonal.

(1.3) Determine all values of  $x$  for which the series  $\sum_{k=1}^{\infty} \frac{8x^{2k}}{3k^2}$  converges. Show work and justify results.

(1.4) Determine if the series  $\sum_{n=1}^{\infty} (-1)^n \left(1 - \frac{6}{n}\right)^{n^2}$  converges or diverges. If the series converges, does it converge conditionally or absolutely? Show work and justify results.

(1.5) Determine if the series  $\sum_{k=1}^{\infty} \ln\left(\frac{k+8}{k+7}\right)$  converges or diverges. If the series converges, does it converge conditionally or absolutely? Show work and justify results.

(1.6) Determine if the series  $\sum_{k=1}^{\infty} \left( \frac{14^k k!}{k^k} \right)$  converges or diverges. If the series converges, does it converge conditionally or absolutely? Show work and justify results.

(1.7) Determine if the series  $\sum_{n=1}^{\infty} \frac{n!}{(2n+6)!}$  converges or diverges. If the series converges, does it converge conditionally or absolutely? Show work and justify results.

(1.8) Determine if the series  $\sum_{k=1}^{\infty} \frac{8^k}{13^k - 8^k}$  converges or diverges. If the series converges, does it converge conditionally or absolutely? Show work and justify results.

(1.9) Determine if the series  $\sum_{k=3}^{\infty} \frac{1}{k^{2/9} \ln k}$  converges or diverges. If the series converges, does it converge conditionally or absolutely? Show work and justify results.

(1.10) Determine if the series  $\sum_{k=1}^{\infty} \left(1 - \frac{a}{k}\right)^{4k}$ ,  $a \in \mathbb{R}$  converges or diverges. If the series converges, does it converge conditionally or absolutely? Show work and justify results.