

Max Score: **10 pts**

Name: _____

GRADING:

- This quiz takes place of our *regular* weekly quiz.
- You will have unlimited time to complete it, though you should *be able to answer ALL these questions on the exam in about 15 minutes* and without any resources like calculator or textbook.

INSTRUCTIONS: Please read the following instructions **carefully**.

- You are allowed to use *ONLY* our class notes and our textbook that is accessible through WileyPLUS.
- You should work on completing this quiz on *your own*, that is, you should *NOT* work with fellow students, roommates, friends, tutors, online chatting buddies, etc.
- You are NOT allowed to look for answers to these specific question on any of the online forums/platforms or apps!!!
- It is ok to use a calculator to *check* your work, BUT you should be able to these problems on the exam without a calculator!
- **Neatness and organization of your answers/submission matter!**
 - Your answers should be submitted as a *single pdf file*.
 - The uploaded pdf file should be titled **YOURLASTNAME-mth243-quiz4.pdf**.
 - Your answers should be *legible and with no scribbles*.
 - Your answers should be written on *the quiz itself* **OR** if writing on a separate paper, then *each new problem should start on a separate page in your pdf submission*.

Failing to follow submission instructions will result in your final score being reduced.

- **All work must be shown for full credit!**

DEADLINE: **11:59pm on Sat., Mar. 23, 2024, via the Assignments tab on Brightspace.**

1. Compute the following quantities:

(a) $z_x(x, y)$ and $z_y(x, y)$, where $z(x, y) = (x^2 + x - y)^7$.

$$z_x(x, y) =$$

$$z_y(x, y) =$$

(b) $\frac{\partial}{\partial x} \left[\frac{1}{a} e^{-x^2/a^2} \right]$

$$\frac{\partial}{\partial x} \left[\frac{1}{a} e^{-x^2/a^2} \right] =$$

(c) $f_x(x, y)$ and $f_y(x, y)$, where $f(x, y) = e^{xy} \cdot \ln(y)$.

$$f_x(x, y) =$$

$$f_y(x, y) =$$

(d) $f_t(t, x)$ and $f_x(t, x)$, where $f(t, x) = \cos^2(t + x) + e^{\sin(t+x)}$.

$$f_t(t, x) =$$

$$f_x(t, x) =$$

(e) $g_x(x, y)$ and $g_y(x, y)$, where $g(x, y) = \frac{\ln(\sin^2(y) + 3)}{x^2y + y^2x}$.

$$g_x(x, y) =$$

$$g_y(x, y) =$$

2. Let (x, y) be the function given by $f(x, y) = \ln(x^2 + xy)$.

(a) Find the *gradient vector* ∇f at the point $(4, 1)$.

(b) Find the *directional derivative* of $f(x, y)$ at the point $(4, 1)$ in the direction of the vector $\vec{v} = 4\vec{i} - 3\vec{j}$.

(c) Find a *local linearization* of $f(x, y)$ at the point $(4, 1)$.

(d) Find the *maximum rate of change* of $f(x, y)$ at the point $(4, 1)$.

(e) Along which direction at the point $(4, 1)$ will varying x and y result in zero change?

END