Math 126 - Spring 2025
Exam 2
May 22, 2025

Name _____

Student ID #_____

Section _____

HONOR STATEMENT

"I affirm that my work upholds the highest standards of honesty and academic integrity at the University of Washington, and that I have neither given nor received any unauthorized assistance on this exam."

SIGNATURE:_____

- This exam consists of this cover, four pages of questions, and a blank "scratch sheet". If you put work on the scratch sheet and you want it to be graded, then you must clearly tell us in the problem to "see scratch page".
- You will have 50 minutes.
- You are allowed to use a Ti-30x IIS Calculator model ONLY (**no other calculators allowed**) and one 8.5 by 11 inch sheet of handwritten notes (front and back). All other sources are forbidden.
- Turn your cell phone OFF and put it away for the duration of the exam. You may not listen to headphones or earbuds during the exam.
- **You must show your work.** The correct answer with no supporting work may result in no credit.
- Leave your answer in exact form. Simplify standard trig, inverse trig, natural logarithm, and root values. Here are several examples: you should write $\sqrt{4} = 2$ and $\cos\left(\frac{\pi}{6}\right) = \frac{\sqrt{3}}{2}$ and $\ln(1) = 0$ and $\tan^{-1}(1) = \frac{\pi}{4}$.
- Unless otherwise indicated, when rounding is necessary, you may round your final answer to two digits after the decimal.
- **Do not write within 1 centimeter of the edge!** Your exam will be scanned for grading.
- There may be multiple versions, you have signed an honor statement, and cheating is a hassle for everyone involved. If we find that you give an answer that is only appropriate for the other version of the exam and there is no work to support your answer, then you will get a zero on the entire exam and your work will be submitted to the academic misconduct board. JUST DO NOT CHEAT.

GOOD LUCK!

1. (10 pts)

(a) (6 pts) Find the linear approximation to $f(x, y) = x^2 \cos(3y) + ye^{2y} + \sqrt{x^3 + 4y}$ at $(1, 0)$.

$$L(x, y) = \_\_\_\_\_$$

(b) (4 pts) Use implicit differentiation to find $\dfrac{\partial z}{\partial x}$ for the curve defined by

$$3z + 1 = x^2 y e^z + \ln(y)$$

.

$$\frac{\partial z}{\partial x} = \_\_\_\_\_$$

2. (14 pts)

(a) (7 pts) Find and classify all the critical points for $f(x,y) = \frac{1}{2}x^2y - x^2 - \frac{1}{2}y^2 + y$. (*Clearly give second derivatives and label your critical points as max, min, or saddle points*).

List and Label: $(x,y) =$ _____

(b) (7 pts) Find the points on the hyperboloid of two sheets $3x^2 + y^2 - z^2 = -1$ that are closest to the point $(8,2,0)$. (*Find a two variable function for the distance, then find the critical points, no justification needed*)

List both: $(x,y,z) =$ _____

3. (12 pts)

(a) (6 pts) Evaluate $\iint_R y\sin(xy)\,dA$ over the rectangle $R = \{(x,y)\,|\,0 \le x \le \frac{\pi}{2}, 0 \le y \le 1\}$.
(*Hint: One order of integration is much easier!*)

$$\iint_R y\sin(xy)\,dA = \_\_\_\_\_$$

(b) (6 pts) Reverse of the order of integration $\int_1^3 \int_{2x}^6 f(x,y)\,dydx$.
(*For full credit, draw the region. Then reverse the order, write the integral and stop*).

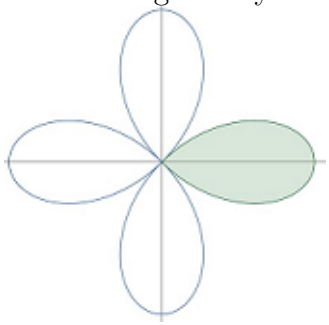
Integral in Reverse Order: _____

4. (14 pts)

(a) (7 pts) Find the volume of the solid that is bounded by $z = 2$ and $z = 10 - 2x^2 - 2y^2$.

Volume = _____

(b) (7 pts) Use a double integral and polar to find the **area** of one loop of the rose given by $r = \cos(2\theta)$. (*shown below*)



$$\iint_D 1\, dA = \_\_\_\_\_$$

You may use this page for scratch-work or extra room.
All work on this page will be ignored unless you write and circle "see scratch page" on the problem and you label your work.