Math 126 - Winter 2024
Exam 2
February 22, 2024

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. (14 pts)

(a) Consider the position function $\mathbf{r}(t) = \left\langle t^2, 6t, \frac{2}{t} \right\rangle$.

Find the positive value of t at which the the acceleration vector and velocity vector are orthogonal AND give the tangential component of acceleration, a_T, at this time.

$t =$ ________________

a_T ________________

(b) Find $f_x(x, y)$ and $f_y(x, y)$ for $z = f(x, y) = y^x + y\sin(x^2 y) + \ln(x)$.

$f_x(x, y) =$ ________________________________

$f_y(x, y) =$ ________________________________

(c) Find $\frac{\partial z}{\partial y}$ for $z^3 + y^2 z = x\sqrt{3 + y^2}$ at $(x, y, z) = (1, 1, 1)$.

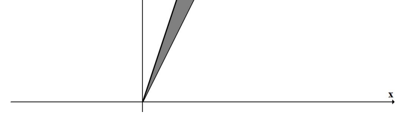
$\frac{\partial z}{\partial y} =$ ________________

2. (12 pts) **The two parts below are not related.**

(a) Find and classify all the critical points for $f(x, y) = 8x\cos(y) - x^2$ such that $0 \le y \le \pi$. (*Clearly, show work using the 2nd derivative test and label your final points as local max/min or saddle points. You do NOT have to find the z-values, just the* (x, y) *points*).

List of Critical Points: ____________________________________

(b) Consider $\displaystyle\int_0^{12}\int_{y/3}^{y/2} g(x, y)\,dxdy$. Rewrite the equivalent integral(s) after reversing the order of integration (Do NOT evaluate). A picture of the region is shown.



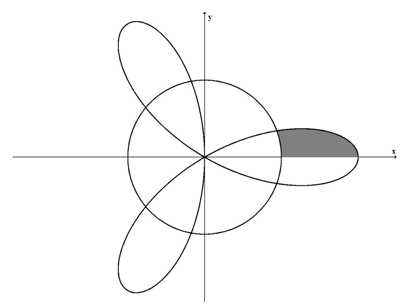
Rewritten integral(s): ____________________________________

3. (12 pts) **The two parts below are not related.**

(a) Find the volume of the solid in the first octant that is bounded by $y = 6$, $y = 2x$ and $z = x^2$.

Volume = ________________

(b) Find the area of the region shown which is between $x^2 + y^2 = 1$, $r = 2\cos(3\theta)$ and above the x-axis.



Area = ________________

4. (12 pts) Find the absolute (*i.e.* global) minimum and maximum values of the function $z = f(x, y) = 5 + 2x^2 + y^2 + 8y$ on the region $D = \{(x, y) : y \geq 0, x^2 + y^2 \leq 25\}$.

(*For full credit: You must very clearly show that you found and analyzed the one variable functions above each boundary curve and that you checked all appropriate points and endpoints*)

global max: $z =$ ____________

global min: $z =$ ____________

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.