

Math 126 E - Autumn 2023
Midterm Exam Number Two
November 16, 2023

Name: _____

Student ID no. : _____

Signature: _____

1	13	
2	4	
3	16	
5	13	
6	14	
Total	60	

*This grid is purely decorative.
The exam is graded online.*

- This exam consists of **FIVE** problems on **FOUR** double-sided pages. The fourth page is left blank for scratch work.
- Show all work for full credit.
- You may use a TI-30X IIS (or equivalent) calculator during this exam. Other calculators and electronic devices are not permitted.
- You do not need to simplify your answers.
- If you use a trial-and-error or guess-and-check method when a more rigorous method is available, you will not receive full credit.
- Draw a box around your final answer to each problem.
- **Do not write within 1 centimeter of the edge!** Your exam will be scanned for grading.
- If you run out of room, write on one of the scratch work pages **and indicate that you have done so**. If you still need more room, raise your hand and ask for an extra page.
- You may use one hand-written double-sided 8.5" by 11" page of notes.
- You have 50 minutes to complete the exam.

You may use this page for scratch-work.

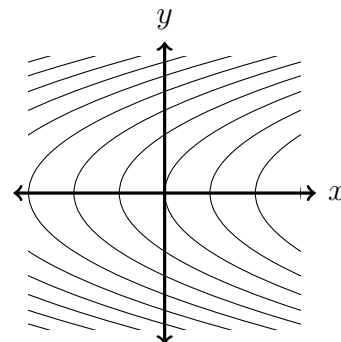
All work on this page will be ignored unless you write & circle “see first page” below a problem.

1. [13 points] Consider the function $f(x, y) = 6xy + x^3 - y^2$.

Find all critical points for f , then classify each one as a local maximum, local minimum, or saddle point.

2. [4 points] Give an example of a function $f(x, y)$ whose level curves are all parabolas that look like this:

*Just write a formula for f . You do not need to show work.
There are many possible answers.*



3. **[16 points]** Let $\mathcal{D}$ be the closed disc of radius 3 centered at the origin.

Find the absolute minimum and maximum values of $f(x, y) = x^2 + 4x + 2y^2$ on $\mathcal{D}$.

4. (a) **[8 points]** Find the equation of the plane tangent to $z = xy^2 - \sqrt{x} - 3 \sin(y - 2)$ at the point $(4, 2, 14)$.

- (b) **[5 points]** Use your answer to part (a) to find an approximate value of y that satisfies the following equation:

$$14.22 = 3.92y^2 - \sqrt{3.92} - 3 \sin(y - 2)$$

NO LONGER COVERED IN MATH 126

Chapter 15 material - covered in Math 224

5. [7 points per part] For each of the following prompts, write the indicated iterated integral.

Do not try to evaluate these integrals! Just set them up as instructed.

- (a) Write an iterated integral for the volume below the surface $z = e^x + y^3$, above the surface $z = 1 + \sin(y)$, and over the rectangle $[3, 5] \times [2, 4]$ in the xy -plane.

- (b) Rewrite $\int_1^{64} \int_{\frac{x-1}{21}}^{\log_4 x} x^2 \sin(y^3) dy dx$ by reversing the order of integration.

You may use this page for scratch-work.

All work on this page will be ignored unless you write & circle “see back page” below a problem.

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