

Math 126 C - Winter 2022
Midterm Exam Number Two
February 24, 2022

Name: _____

Student ID no. : _____

Signature: _____

1	12	
2	4	
3	14	
4	8	
5	8	
6	14	
Total	60	

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

- This exam consists of **SIX** 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. **[12 points]** Find all critical points of the function $f(x, y) = x^4 - 18x^2 - y^2 + 6y$.
Classify each critical point as a local minimum, local maximum, or saddle point.

2. **[4 points]** Give an example of a function that has only one saddle point, located at $(1, 2, 3)$.
You do not need to fully justify your answer. Coming up with an example is enough.
This problem is worth 4 points. If you're stuck, try the other problems and come back to it later!

3. **[14 points]** Let \mathcal{D} be the disc of radius 3 centered at the origin.

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

4. **[8 points]** Suppose the plane tangent to the surface $z = f(x, y)$ at $(3, 2, 3)$ passes through the points $(2, 4, 1)$ and $(1, 2, -3)$.

Find $f_x(3, 2)$ and $f_y(3, 2)$.

5. **[8 points]** Compute the integral $\int_0^2 \int_0^3 y(\sin(xy) + 3) dy dx$.

6. [7 points per part] Rewrite the following integrals as instructed.

Do not try to evaluate these integrals! Just rewrite them.

(a) $\int_1^3 \int_{2^x}^{3x-1} \sqrt{5x+7} \cos(xy) \, dy \, dx.$ Reverse the order of integration.

\uparrow
(That's 2 raised to the x^{th} power.)

(b) $\int_0^3 \int_x^{\sqrt{6x-x^2}} \sin(\sqrt{x^2+y^2}) \, dy \, dx.$ Convert this to a polar integral.

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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