MATH 126 – CHAPTER 14 PRACTICE EXAM

Sample B

Your Name

Your Signature

About this practice exam

These problems are drawn from previous Math 126 exams, assigned WebAssign homework, and course worksheets/test preps. They have been reorganized into a complete practice exam. This is one of five practice exams designed to help you prepare for Exam 2. The questions and difficulty are *not* a prediction of the actual exam. Sources and related homework appear below each problem. Try the exam under timed conditions, then use the solutions to review your work.

Instructions

- CHECK that your practice exam contains 7 problems on 6 pages (3 double-sided sheets), including this cover page and one scratch page at the end.
- Allow 50 minutes.
- Work as though this were a closed-book exam. You may use one $8\frac{1}{2}'' \times 11''$ sheet of handwritten notes (front and back) and a TI-30X IIS calculator. Do not share notes or calculators.
- Unless otherwise specified, give answers in exact form (for example, $\pi/4$ or $\sqrt{2}$ rather than decimals).
- In order to receive full credit, show all your work.
- **Write your answers in the provided blanks or clearly box your final answers.**
- If you need more room, use the scratch page at the end and clearly indicate where your additional work can be found.
- **Do not write within 1 centimeter of the edge of the page.**

Problem	1	2	3	4	5	6	7	Total
Points	12	4	6	5	10	11	12	60

GOOD LUCK!

1. (12 pts) Tangent plane and approximation – *Sections: 14.3, 14.4*

Source: Ostroff, Autumn 2023 Exam 2, Problem 4. Similar practice: HW 14.4; Week 6 Thursday TP.

Find the tangent plane to $z = xy^2 - \sqrt{x} - 3\sin(y-2)$ at $(4, 2, 14)$. Then use your plane to approximate y satisfying

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

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2. (4 pts) Implicit partial derivative – *Sections: 14.3, 14.5*

Source: Week 6 Thursday Test Prep, Problem 4 (from Loveless Spring 2019). Similar practice: HW 14.5.

If $e^{2z} = x + y^2 z$ defines $z = z(x, y)$, find $\partial z/\partial y$ in terms of x, y, z.

3. (6 pts) Tangent line in a surface cross-section – *Sections: 14.3, 14.4*

Source: WebAssign HW 14.3 (Part 2), Problem 10 (Stewart 14.3.094).

The surface $z = 7 - x - x^2 - 3y^2$ meets the plane $x = 2$ in a parabola. Find parametric equations for the line tangent to this parabola at $(2, 3, -26)$.

4. (5 pts) Temperature and gradient – *Section: 14.6*

Source: Loveless, Winter 2012 Math 324 Exam 2, Problem 5. Similar practice: HW 14.6; Week 7 Tuesday Worksheet.

For $T(x, y) = \frac{1}{3}x^2y + 5\sqrt{x^2 + y^2}$ in degrees Celsius (x, y in feet), find $\nabla T(3, 4)$ and the directional derivative in the direction $\langle -1, 2 \rangle$. Give units.

5. (10 pts) Find and classify – *Section: 14.7*

Source: Ostroff, Autumn 2021 Exam 2, Problem 3. Similar practice: HW 14.7; Week 7 Tuesday Worksheet.

Find and classify all critical points of $f(x, y) = xy^2 - 2xy + x^2$ using the second derivative test.

6. (11 pts) Global maximum and minimum on a disk – *Section: 14.7*

Source: Ostroff, Autumn 2023 Exam 2, Problem 3. Similar practice: HW 14.7; Week 7 Thursday Test Prep.

Find the absolute maximum and minimum values of $f(x, y) = x^2 + 4x + 2y^2$ on the closed disk $D = \{(x, y) : x^2 + y^2 \leq 9\}$. Check the interior and the boundary, and state where both extrema occur.

7. (12 pts) Maximum-volume box – *Sections: 14.7, 14.8*

Source: Historical Math 126 Exam 2, first-octant box question (archived with old solutions). Similar practice: Optimization Applications HW.

Find the dimensions of the rectangular box of maximum volume in the first octant, with three faces in the coordinate planes and its opposite vertex (x, y, z) on $4x + 3y + z = 12$. Use the second derivative test to verify the critical point gives a local maximum.

You may use this page for scratch-work or extra room.

All work on this page will be ignored unless you clearly indicate on the relevant problem that additional work appears here, and label that work with the problem number.