PRACTICE EXAM 5 FOR APRIL 11 MIDTERM

APRIL 11, 2022 (80 MINUTES)

Name:

NetId:

Instructor’s Name:

Section:

This examination booklet contains 6 questions on 10 pages of paper including the front cover.

Do all of your work in this booklet, show all your computations and justify/explain your answers. Your justification must be based on techniques already discussed in this course. If asked to evaluate an integral, remember to show all the steps that gives you its value.

Except for your personal note sheet, no other resources like class notes, books, calculator, etc are allowed. Remember that your note sheet must be handwritten, on both sides of a single sheet of paper.

Unless otherwise state, give exact answers. For example, write π and √2 instead of 3.14 and 1.41. However, when an expression simplifies to a well-known value, you must use that value. For example, you must write 1 instead of e^0, and you must write π/3 instead of sec^{-1}(2).

If you run out of space when answering a problem, you may use any of the last three pages of the exam, but you must: indicate in the space below the question that you are continuing your answer on the extra sheet, and indicate on the extra sheet which problem you are working on.

Do not discuss the exam with anyone until grades are posted on Canvas.

This section is reserved for the instructor or grader

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WRITE OUT AND SIGN PLEDGE

On my honor, I have neither received nor given any unauthorized assistance on this examination.
Problem 1. [*] Sketch the region of integration

\[ \int_0^{2\sqrt{\ln 5}} \int_{y/2}^{\sqrt{\ln 5}} 5e^{x^2} \, dx \, dy \]

and evaluate it.
Problem 2. (*) Convert the polar integral to a cartesian integral and sketch the region of integration

\[ \int_0^{\pi/4} \int_0^{3 \sec \theta} r^5 \sin^2 \theta dr d\theta \]

Do not evaluate it.
Problem 3. [*] Let $f(x, y, z) = z^2$ and let $\mathcal{D}$ be the solid region bounded by the cone $z = \sqrt{x^2 + y^2}$ and the paraboloid $z = \frac{1}{5}(x^2 + y^2)$. Express

$$\iiint_{\mathcal{D}} z^2 \, dV$$

in spherical coordinates. Do not evaluate it.
Problem 4. [*] Let $D$ be the solid in the first octant bounded by the planes $y = 0$, $z = 0$ and $y = x$ and the cylinder $81x^2 + z^2 = 81$. Write the integral of $f(x, y, z)$ over $D$ in the order $dzdx dy$. Do not evaluate it.
Problem 5. [*] Classify the critical point of

\[ f(x, y) = 7x - 5y^2 - \ln(x + y) \]

using the second derivative test.
Problem 6. [*] Consider the region $R$ determined by the inequalities $8 \leq x + y \leq 9$ and $-9 \leq y - 2x \leq 8$. Using the change of variables

$$u = x + y, \quad v = y - 2x$$

find the value of

$$\int \int_{R} e^{x+y} \, dA$$
YOU CAN USE THIS PAGE FOR ANY QUESTION OF THE EXAM OR SCRATCH-WORK:
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