Math 32B - Fall 2020, Lecture 1

Midterm 1, Friday Nov 6

Full Name: _____

UID: _____

Instructions:

- This is a closed book and closed notes exam. Please put away any study materials once you begin this exam.
- Read each problem carefully.
- Show all work clearly and circle or box your final answer where appropriate.
- Justify your answers. A correct final answer without valid reasoning will not receive credit.
- Calculators and formula sheets are not permitted.
- The pdf of this file is available for you to print, write your answers in the space provided and then reupload on gradescope. You may alternatively note down the problems and solve on separate sheets of paper.
- Please make sure your uploads are legible and that you clearly mark where each question begins and ends to prevent any mistakes in grading, especially if not using the provided format.
- Please sign the honor code below. Any midterm without a signed honor code will receive a score of 0. If using your own paper, please copy out the honor code and sign it.

Pledge: I assert, on my honor, that I have not received assistance of any kind from any other person while working on the final and that I have not used any non-permitted materials or technologies during the period of this evaluation.

Student's Signature:

1. (20 points) Integrate the function $e^{x^2+y^2}$ over the disk D described by the inequality $x^2 + y^2 \leq 1$.

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2. Consider the hemispherical region R described by the inequalities

$$x^2 + y^2 + z^2 \leq 4, y \geq 0.$$

(a) (10 points) Let R have mass density function

$$f(x, y, z) = |z| = \begin{cases} z & \text{if } z \geq 0 \\ -z & \text{if } z \leq 0 \end{cases}.$$

Compute the total mass of the solid in the region R.

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(b) (20 points) Find the coordinates of the center of mass of R.

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3. (20 points) Let D be the domain in the xy-plane described by the inequalities

$$1 \leq xy \leq 4,\ 0 \leq x - y \leq 1,\ x, y \geq 0.$$

Use a change of variables to integrate the function $f(x, y) = x + y$ over the domain D.

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4. Consider the integral

$$\int_0^1 \int_{y^2}^{y} y \, \mathrm{dx} \, \mathrm{dy}.$$

(a) (10 points) Describe the domain of integration as a simple region of horizontal type and sketch it.

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(b) (10 points) Describe the domain of integration as a simple region of vertical type.

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(c) (10 points) Compute the integral in the order $dy\,dx$.

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