

UNIVERSITY OF HAWAI'I



Last name: _____

First name: _____

Question:	1	2	3	4	5	Total
Points:	10	10	10	10	10	50
Score:						

Instructions:

- Make sure to write your complete name on your copy.
- You must answer all 5 questions below and write your answers directly on the questionnaire.
- You have 50 minutes to complete the exam.
- When you are done (or at the end of the 50min period), return your copy.
- Any electronic devices are not allowed during the exam.
- You can use a calculator.
- **Turn off your cellphones during the exam.**
- Lecture notes and the textbook are not allowed during the exam.
- You must show ALL your work to have full credit.
- Draw a square around your final answer.

Your Signature: _____

QUESTION 1

(10 pts)

A lamina occupies a region D described as followed:

$$D = \{(x, y) : 0 \leq x \leq 1, 0 \leq y \leq x^2\}.$$

The mass density of the lamina is proportional to the distance from the vertical line $x = 1$ to the y -axis. Compute the mass of the lamina.

QUESTION 2

(10 pts)

A lamina occupies a region D which is a rectangle $D = [0, 1] \times [0, 2]$ and has a mass density of $\rho(x, y) = y$. Find

- (a) (5 points) the moment M_x about the x -axis. Recall that this is the double integral of the function $y\rho(x, y)$.
- (b) (5 points) the moment M_y about the y -axis. Recall that this is the double integral of the function $x\rho(x, y)$.

QUESTION 3

(10 pts)

Evaluate the integral

$$\int_0^2 \int_0^{z^2} \int_0^{y-z} (2x - y) \, dx \, dy \, dz.$$

QUESTION 4

(10 pts)

Find the volume of the solid E enclosed by the surface $y = x^2$ and the planes $z = 0$ and $y + z = 1$.

QUESTION 5

(10 pts)

Evaluate¹

$$\iiint_E e^{\sqrt{x^2+y^2+z^2}} dV$$

where E is the portion of the unit ball $x^2 + y^2 + z^2 \leq 1$ that lies in the first octant.

¹You can take for granted that $\int t^2 e^t dt = e^t(t^2 - 2t + 2) + C$.

BONUS QUESTION

Draw the surface given by the equation $\rho = \sin \phi$.