

# Midterm 2 practice

## UCLA: Math 32B, Fall 2019

*Instructor:* Noah White

*Date:* May, 2018

*Version:* practice

- This exam has 4 questions, for a total of 40 points.
- Please print your working and answers neatly.
- Write your solutions in the space provided showing working.
- Indicate your final answer clearly.
- You may write on the reverse of a page or on the blank pages found at the back of the booklet however these will not be graded unless very clearly indicated.
- Non programmable and non graphing calculators are allowed.

Name: \_\_\_\_\_

ID number: \_\_\_\_\_

Question	Points	Score
1	10	
2	8	
3	8	
4	14	
Total:	40	

1. (a) (5 points) Compute the center of mass of the region in the  $xy$ -plane above the  $x$ -axis and below the curve  $y = 1 - x^2$ . Assume a constant mass density of 1.

- (b) (5 points) Determine the surface area of the paraboloid

$$x^2 + y^2 = 2z, \quad 0 \leq z \leq 1.$$

2. (8 points) Consider the region  $\mathcal{E}$  given by

$$0 \leq z \leq (y - x^2)^2, \quad x^2 \leq y \leq x.$$

Use the change of variables

$$x = u, y = v + u^2, z = wv^2,$$

to evaluate

$$\int_{\mathcal{E}} \frac{1}{y - x^2} \, dV.$$

3. Let  $\mathbf{F}$  be a vector field given by

$$\mathbf{F}(x, y, z) = (y \cos z - yze^x, x \cos z - ze^x, -xy \sin z - ye^x).$$

- (a) (4 points) Show that  $\mathbf{F}$  is conservative.
- (b) (4 points) Find a potential function for  $\mathbf{F}$ .

4. In this question we will calculate the surface area of the ellipsoid  $\frac{x^2}{a^2} + \frac{y^2}{a^2} + z^2 = 1$ .
- (a) (4 points) Find a parameterisation of the ellipsoid given above.
  - (b) (5 points) Express the surface area as a double iterated integral.
  - (c) (5 points) Evaluate the surface area when  $a = 2$ . You may use the fact that

$$\int \sqrt{1+x^2} \, dx = \frac{1}{2}\sqrt{1+x^2} + \frac{1}{2} \ln \left( \sqrt{1+x^2} + x \right) + C.$$

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