

# 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 35 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	9	
Total:	35	

1. (a) (5 points) Let  $\mathcal{D}$  be the region in the  $xy$ -plane above the  $x$ -axis and below the curve  $y = 1 - x^2$ . Compute the integrals

$$I_1 = \frac{1}{A} \iint_{\mathcal{D}} x \, dA \text{ and } I_2 = \frac{1}{A} \iint_{\mathcal{D}} y \, dA$$

where  $A$  is the area of  $\mathcal{D}$ .

- (b) (5 points) Parametrize the paraboloid and find the normal vector for this parametrisation.

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

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

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

3. Let  $\mathbf{F}$  be the vector field on  $\mathbb{R}^3$  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) Find the normal vector to this parameterisation and its length.

This page has been left intentionally blank. You may use it as scratch paper. It will not be graded unless indicated very clearly here and next to the relevant question.

This page has been left intentionally blank. You may use it as scratch paper. It will not be graded unless indicated very clearly here and next to the relevant question.