

Math 21B-0U1, Fall 2020  
November 20, 2020

## TAKEHOME MIDTERM 2

Due: Today 11/20 at 18:10

NAME(use CAPITAL letters, *first name first*):\_\_\_\_\_

NAME(sign):\_\_\_\_\_

ID#:\_\_\_\_\_

**HONOR STATEMENT:** By signing this paper, I hereby declare that I solved this exam by my own, without any external collaboration (like friends, internet solutions, etc). If needed, I am allowed to use our lecture notes only. I understand that the main purpose of this exam is to show how much I have learned in this course, holding myself to a high standard of academic integrity, and that suspected misconduct on this exam will be reported to the Office of Student Support and Judicial Affairs and, if established, will result in disciplinary sanctions up through Dismissal from the University and a grade penalty up to a grade of 'F' for the course.

**Instructions:** Each of the 4 problems has equal worth. Read each question carefully and answer it in the space provided, or answer it in a separate paper and sign that paper; it is optional to print this exam. **YOU MUST SHOW ALL YOUR WORK TO RECEIVE FULL CREDIT.** Clarity of your solutions may be a factor when determining credit. Unless directed to do so, do *not* evaluate complicated expressions to give the result as a fraction or a decimal number. If you are using any of the problems in the textbook, then you have to solve it.

**To deliver:** Submit your solutions on Gradescope, as you did with the MT1. Sign and submit the honor statement (write it down by hand, if needed).

Make sure that you have a total of 5 pages (including this one) with 4 problems.

1	
2	
3	
4	
TOTAL	

1. (a)  $\langle 13pts \rangle$  The base of a solid  $S$  is the triangular region with vertices  $(0, 0)$ ,  $(1, 0)$  and  $(0, 1)$ . Cross-sections perpendicular to the  $y$ -axis are equilateral triangles. Find the volume of  $S$ .

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- (b)  $\langle 12pts \rangle$  Suppose that a circular swimming pool has a diameter of 24 ft, the sides are 5 ft high, and the depth of the water is 4 ft. How much work is required to pump all of the water out over the side?

2. (a)  $\langle 12pts \rangle$  Calculate the volume of the solid generated by revolving about the  $x$ -axis the region bounded by the curves  $y = \sec x$ ,  $y = \tan x$ , and the lines  $x = 0$  and  $x = 1$ .

- (b)  $\langle 13pts \rangle$  Find the area of the surface obtained by rotating the curve  $y = \sqrt{1 + e^x}$  about the  $x$ -axis, for  $0 \leq x \leq 1$ .

3. Evaluate the following integrals

(a)  $\langle 13pts \rangle \int x \ln(1+x) dx$

(b)  $\int (\ln x)^3 dx$

4. Determine whether the following statements are True or False. Justify your answers.

(a) *(13pts)* For the curve  $y = \frac{1}{4}e^x + e^{-x}$ , the arc length on any interval  $[a, b]$  has the same value as the area under the curve on  $[a, b]$ .

(b) *(12pts)* If  $n \geq 1$  is an integer, then  $\ln\left(\frac{n+1}{n}\right) \leq \frac{1}{n}$ . [*Hint: FTC and a picture*]