

Math 21B, Winter 2022.  
Feb. 25, 2022.

## MIDTERM EXAM 2

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

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

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

**Instructions:** Each of the 4 problems has equal worth. Read each question carefully and answer it in the space provided. *You must show all your work for full credit.* Clarity of your solutions may be a factor when determining credit. Calculators, books or notes are not allowed. The proctors have been directed not to answer any interpretation questions.

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

1	
2	
3	
4	
<b>TOTAL</b>	

$$\sin A \sin B = \frac{1}{2}(\cos(A - B) - \cos(A + B))$$

$$\sin A \cos B = \frac{1}{2}(\sin(A - B) + \sin(A + B))$$

$$\cos A \cos B = \frac{1}{2}(\cos(A - B) + \cos(A + B))$$

$$\sin^2 A = \frac{1}{2}(1 - \cos(2A)), \quad \cos^2 A = \frac{1}{2}(1 + \cos(2A))$$

1. Compute the following two indefinite integrals.

(a)  $\int \frac{1}{\sqrt{x+1}+1} dx$

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(b)  $\int \frac{1}{x^2 + 2x + 2} dx$

2. Compute the following two definite integrals.

(a)  $\int_0^{\pi/4} \cos(3x) \cos x \, dx$

(b)  $\int_1^2 \frac{2}{x^3 + 3x^2 + 2x} \, dx$

3. The region  $R$  lies between  $x = 0$  and  $x = \pi/2$  and is bounded by the graphs of  $y = \cos x$  and  $y = 0$ .
- (a) Rotate  $R$  around the  $x$ -axis and compute the volume of the resulting solid.

- (b) Rotate the region around the  $y$ -axis and compute the volume of the resulting solid.

4. Consider the curve given as the graph of the function  $y = \ln(x + 1)$ , for  $0 \leq x \leq 1$ . Write down, but *do not compute* the integrals for quantities specified below.

(a) The arc length of this curve.

(b) The surface area of the surface obtained by revolution of this curve around the  $x$  axis.

(c) The surface area of the surface obtained by revolution of this curve around the line  $y = 1$ . (Explain why this line does not intersect the curve!)