

# Math 244 Exam 1, Fall 2023

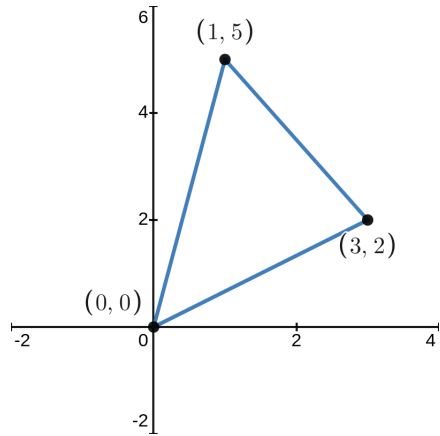
Name:

Question	Points	Score
1	8	
2	12	
3	8	
4	12	
5	0	
Total:	40	

- You have 50 minutes to complete this exam.
- Please ask if anything seems confusing or ambiguous.
- You must show all your work unless the problem states otherwise. You will get almost no credit for solutions that are not fully justified.
- You may use a 3x5 notecard with notes, no other resources are authorized.
- You may use a scientific calculator, no other electronic devices are authorized.
- The back side of each page can be used as scratch paper.

Homework	
Exam 1	
Total	

1. (8 points) Set up the double integral  $\iint_D f(x, y) dA$  as a sum of type I and/or type II double integrals,  $D$  is the triangular region pictured below.

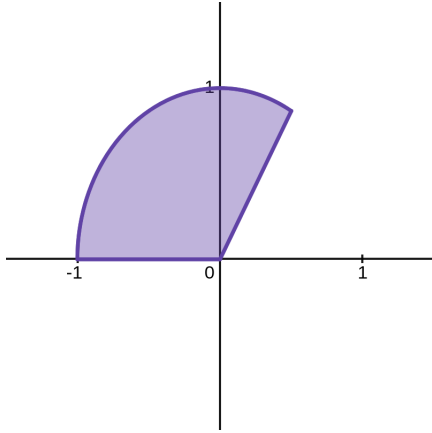


2. (12 points) Find the surface area of the portion of plane  $3x + 6y + 2z = 6$  in the first octant.

3. (8 points) Evaluate the double integral

$$\iint_D \cos(x^2 + y^2) dA,$$

by changing the integral to polar coordinates,  $D$  is the region bounded by the lines  $y = 0$ ,  $y = \sqrt{3}x$  and the circle  $x^2 + y^2 = 1$  (see the picture below).



4. Let  $X$  and  $Y$  be continuous random variables with uniform distribution over the rectangle  $R$  defined by  $0 \leq X \leq 4$  and  $2 \leq Y \leq 6$ . In other words, every point in  $R$  is equally likely. Then the probability density function is given by

$$f(x, y) = \begin{cases} C & \text{if } (x, y) \in R, \\ 0 & \text{otherwise.} \end{cases}$$

- (a) (4 points) Find the constant  $C$  that makes  $f$  a probability density function.
- (b) (4 points) Find the probability  $P(1 \leq X \leq 3 \text{ and } 3 \leq Y \leq 6)$ .
- (c) (4 points) Find the expected value of the random variable  $X$ .

5. (5 points (bonus)) Evaluate  $\int_0^4 \int_{-2}^{-\sqrt{y}} \frac{1}{x^3 + 1} dx dy$ .