

**MAT 203      MIDTERM II**

THURSDAY NOVEMBER 13, 2025  
11:00–12:20PM

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

**Instructions.**

- (1) Fill in your name and Stony Brook ID number.
- (2) This exam is closed-book; no electronic devices. You are only allowed to have one (1) sheet of your own notes.
- (3) You have 80 minutes to complete this exam.
- (4) You must justify all your answers and show all your work. Even a correct answer without any justification will result in no credit.

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1. (a) (5 pts) Compute the limit  $\lim_{(x,y) \rightarrow (1,1)} \frac{x^2 - y^2}{x - y}$ .

(b) (5 pts) The function  $f(x, y) = \ln(3x^2 + 7y^2 + 1)$  is differentiable. Find the equation for the tangent plane of its graph at the point  $(x, y) = (1, 0)$ .

2. Consider the function  $f(x, y) = 2xy - x$ .

(a) (2 pts) Find all critical points for  $f(x, y)$ .

(b) (8 pts) Find the global maximum, and global minimum of  $f(x, y)$  in the region of the  $xy$ -plane bounded by the line  $y = 1$ , and the parabola  $y = x^2$ .

3. (10 pts) Let  $B$  be the rectangular box

$$B = [\pi, 2\pi] \times [0, \pi] \times [0, 1] = \{(x, y, z) \in \mathbb{R}^3 \mid \pi \leq x \leq 2\pi, 0 \leq y \leq \pi, 0 \leq z \leq 1\}.$$

Compute the following triple integral

$$\iiint_B e^z \cos(x + y) \, dx dy dz.$$

4. (10 pts) Let  $D$  be the domain in the  $xy$ -plane consisting of those points  $(x, y)$  satisfying the inequalities  $y \geq |x|$  and  $x^2 + y^2 \leq 1$ . Compute the double integral

$$\iint_D y \, dx \, dy.$$