Math 126 A - Winter 2019
Midterm Exam Number Two
February 28, 2019

Name: _____ Student ID no. : _____

Signature: _____

1	10	
2	10	
3	10	
4	10	
5	10	
Total	50	

- This exam consists of **five** problems on **four** double-sided pages.
- Show all work for full credit.
- You may use a TI-30X IIS calculator during this exam. Other calculators and electronic devices are not permitted.
- You do not need to simplify your answers.
- If you use a trial-and-error or guess-and-check method when a more rigorous method is available, you will not receive full credit.
- Draw a box around your final answer to each problem.
- **Do not write within 1 centimeter of the edge!** Your exam will be scanned for grading.
- If you run out of room, write on the back of the first or last page and indicate that you have done so. If you still need more room, raise your hand and ask for an extra page.
- You may use one hand-written double-sided 8.5" by 11" page of notes.
- You have 50 minutes to complete the exam.

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1. **[10 points total]** Consider the points $A(1,0,0)$, $B(0,1,0)$ and $C(0,0,1)$.

   (a) **[3 points]** Find the equation for the plane passing through the points A, B, C in the form $z = a - bx - cy$.

   (b) **[2 points]** Write down the function $f(x,y)$ representing the **square** of the distance from the origin $(0,0,0)$ to the point $(x,y,a-bx-cy)$ on the plane from part (a).

   (c) **[5 points]** Find the critical points of the function $f(x,y)$ from part (b) and use the second derivative test to find the point on the plane from part (a) which is closest to the origin $(0,0,0)$.

2. **[10 points]** Find and classify the critical points of the function $f(x, y) = x^3 + y^3 - 3xy$.

3. **[10 points]** Compute the double integral

$$\int_R xe^{xy} dA$$

where $R = [0, 1] \times [0, 2]$ is the rectangle $\{(x, y) : 0 \leq x \leq 1, 0 \leq y \leq 2\}$.

4. **[10 points]** Compute the volume of the solid that lies above the region in the xy-plane bounded by the curve $y = x^2$, the horizontal line $y = 1$, and the y-axis; and under the surface $z = xy$.

5. **[10 points total]**

(a) **[2 points]** Write down the function $f(x, y)$ that represents the **square** of the distance from the point $(11, 22, 0)$ to the point $(x, y, x^2 + y^2)$ on the paraboloid $z = x^2 + y^2$.

(b) **[3 points]** Show that the $(1, 2)$ is a critical point of the function $f(x, y)$ from part (a).

(c) **[5 points]** Show that $(1, 2, 5)$ is the closest point on the paraboloid $z = x^2 + y^2$ to the point $(11, 22, 0)$ by showing, using the second derivative test, that $(1, 2)$ is a local minimum of the function $f(x, y)$ from part (a).