

Math 234	Exam II	Spring 2017
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Name: _____ TA: ☐ Jing Hao ☐ Vlad A. Matei

Section: _____ ☐ Moises Herradon ☐ Tony Yuan

☐ Brandon J. Legried ☐ Yuhua Zhu

- You may **not** use a calculator, notes, a notecard, or books.
- Show your work and write clearly.
- Make sure that your answers stand out.
- *Good Luck!*

Question	Points	Score
1	14	
2	14	
3	15	
4	15	
5	14	
6	14	
7	14	
Total:	100	

1. Suppose that $P(x, y) = Ax^2 + y^2$ and $Q(x, y) = Bx^2y + Cxy$, where A , B , and C are constants.
- (a) [7 points] For which values of the constants A , B , and C does there exist a function $f(x, y)$ such that $f_x = P$ and $f_y = Q$?

Answer:

- (b) [7 points] Find such a function $f(x, y)$ for those values of A , B , and C for which it exists.

Answer:

2. Consider the function $f(x, y) = 3xy - x^3 - y^3$.

(a) [7 points] Find all of the critical points of f .

Answer:

(b) [7 points] For each critical point, classify it as a local maximum, local minimum, or saddle point of f .

Answer:

3. [15 points] Maximize $f(x, y) = xy$ subject to the constraint $8x^2 + y^2 = 1$.

Answer:

4. [15 points] Find the volume of the solid bounded by the cylinders $x^2 + y^2 = 1$ and $x^2 + z^2 = 1$.

Answer:

5. [14 points] Evaluate the following integral by *first changing the order of integration*:

$$\int_0^1 \int_{\sqrt{x}}^1 x e^{y^5} dy dx.$$

Answer:

6. [14 points] An object occupies the region inside the sphere of radius 3 and its density is given by $\mu(x, y, z) = \frac{1}{\sqrt{x^2 + y^2 + z^2}}$. Find its mass.

Answer:

7. [14 points] Find $\int_{\mathcal{C}} (x-1)^2 + y^2 ds$, where $\mathcal{C}$ is the circle $x^2 + y^2 = 4$ (traversed once).

Answer: