Math 126 F - Winter 2018
Midterm Exam Number Two
February 22, 2018

Name: ______________________ Student ID no. : ______________

Signature: ____

1	12	
2	12	
3	12	
4	14	
5	10	
Total	60	

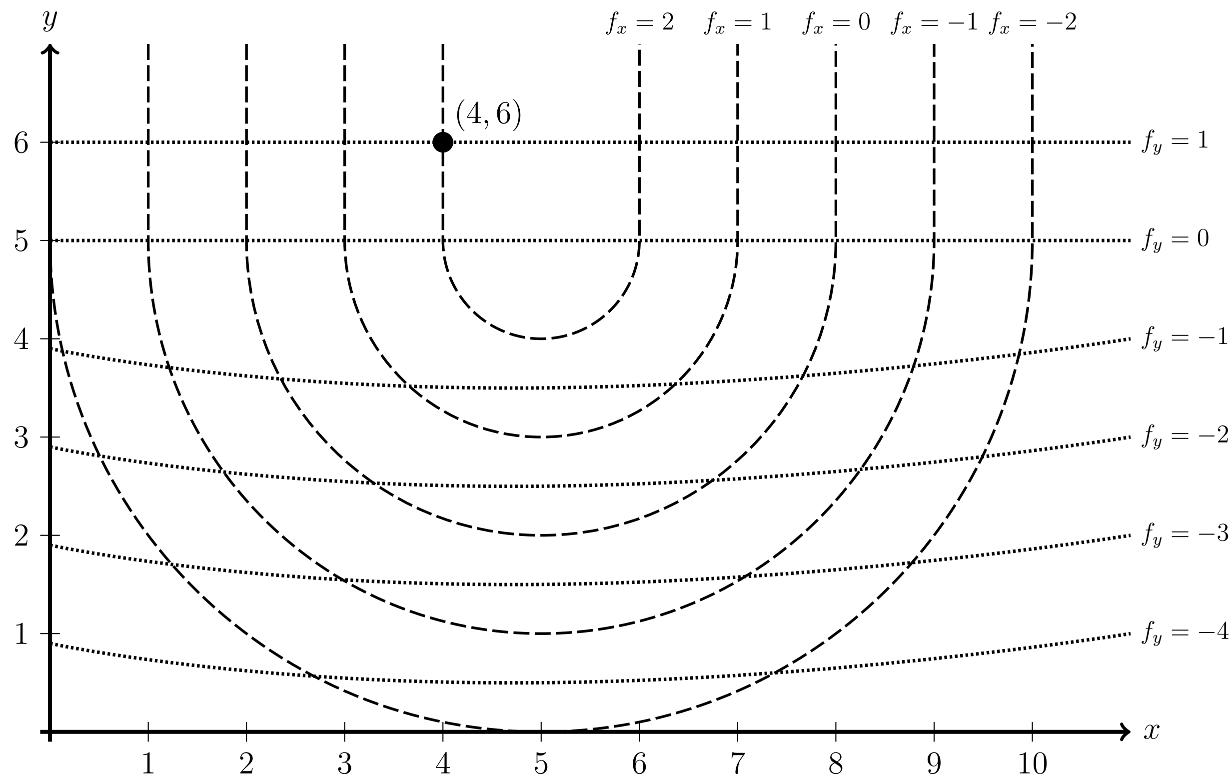
- This exam consists of **five** problems on **four** double-sided pages.
- Show all work for full credit.
- You may use a TI-30X IIS calculator during this exam. Other calculators and electronic devices are not permitted.
- You do not need to simplify your answers.
- If you use a trial-and-error or guess-and-check method when a more rigorous method is available, you will not receive full credit.
- $\boxed{\text{Draw a box}}$ 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 80 minutes to complete the exam.

1. **[12 points]** Consider the implicitly defined surface $-x^2y - xz^2 + yz^4 = 16$.

   Write an equation for the plane tangent to this surface at the point $(3, 4, 2)$.

2. **[6 points per part]** Oh, nice, it's this graph again.

Below are the **level curves** of the **partial derivatives** of a function $f(x, y)$.



(a) The point $(4, 6)$ is marked on the graph above.

Suppose $f(4, 6) = 3$. Use linearization to approximate $f(4.2, 5.9)$.

(b) Consider the rectangle $R = \{(x, y) \mid 2 \leq x \leq 5, 1 \leq y \leq 3\}$.

Where are the absolute minimum and maximum of $f(x, y)$ on R?

Indicate each point on the graph, and explain your reasoning below.

3. **[12 points]** Consider the function $f(x, y) = x^2 + 2xy + y^3 - 4y^2 - 45y + 10$.

   Find all critical points of f. Classify them as local maxima, local minima, or saddlepoints.

4. **[7 points per part]** Evaluate each integral.

(a) $$\int_1^3 \int_2^4 y e^{xy} \, dy \, dx$$

(b) $$\int_0^1 \int_{\sin^{-1}(y)}^{\frac{\pi}{2}} \sqrt{1+\cos(x)} \, dx \, dy$$

5. **[10 points]** Find the volume of the solid bounded by the paraboloid $z = 2x^2 + 2y^2 - 30$ and the plane $z = 2$.