Math 126 G - Autumn 2017
Midterm Exam Number Two
November 16, 2017

Name: _____ Student ID no. : _____

Signature: _____

1	9	
2	10	
3	9	
4	16	
5	16	
Total	60	

- This exam consists of FIVE problems on SIX pages, including this cover sheet.
- Show all work for full credit. Show no work for zero credit.
- 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.
- Write all of your work on the exam itself. If you use the back of the page, please indicate that you have done so!
- You may use a TI-30X IIS on this exam. No other electronic devices are allowed.
- 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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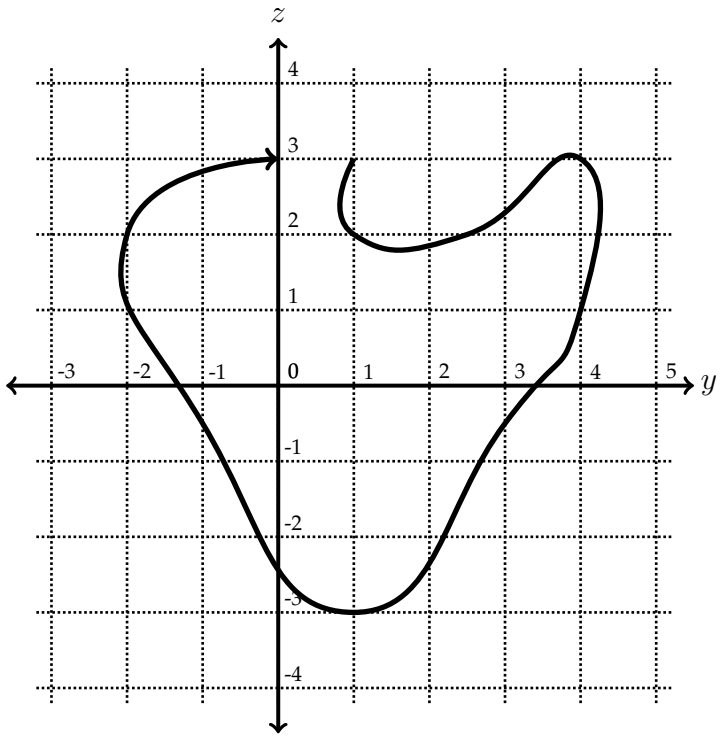
1. **[3 points per part]** Suppose $\mathbf{r}(t) = \langle 0, y(t), z(t) \rangle$ for some functions $y(t)$, $z(t)$.
   Here's a picture of the space curve of $\mathbf{r}(t)$ in the yz-plane.



   (a) Compute $\mathbf{T}$, $\mathbf{N}$, and $\mathbf{B}$ at the point $(0, 1, -3)$.

   (b) Find another point on the graph where $\mathbf{B}$ exists, but is different from the vector you found in part (a).

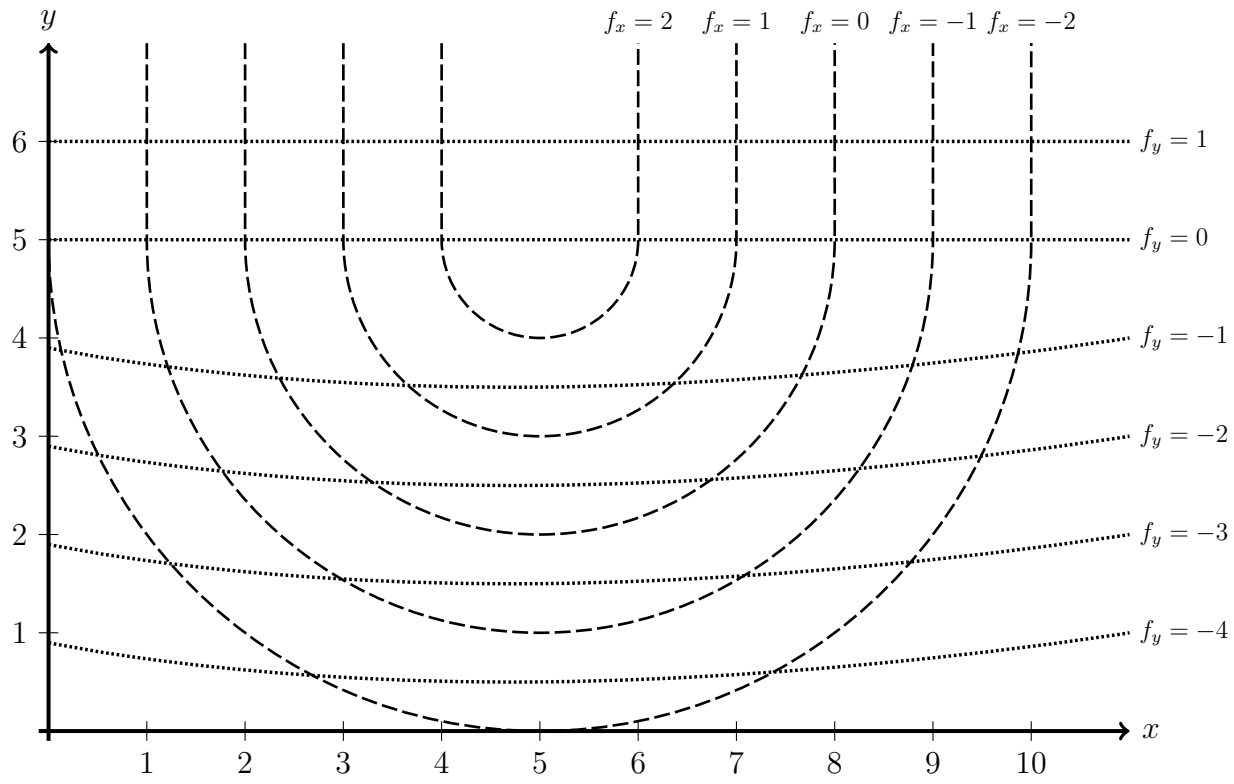
   (c) Estimate the curvature at the point $(0, 4, 3)$.
   (You don't have to be very accurate, but you should show your reasoning.)

2. **[10 points]** Consider the surface

$$z = f(x, y) = y \arctan(x) + xy^2 e^y.$$

Find the equation of the plane tangent to this surface at the point $(1, 4, f(1, 4))$.

3. **[9 points]** Below are the **level curves** of the **partial derivatives** of a function $f(x, y)$.

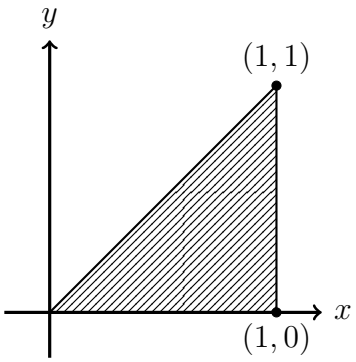


(a) Find the critical points of f.

(b) Identify each critical point as a local maximum, local minimum, or saddlepoint.

4. **[16 points]** Consider the function $f(x, y) = x + xy - 3y^2$.

   Find the maximum and minimum values of $f(x, y)$ on the triangle D pictured below:



5. **[8 points per part]** For each f and D shown below, compute $\iint_D f(x,y)\,dA$.

(a) $f(x,y) = x^5 \sin(x^3 y)$

D is the rectangle $[1,2] \times [0,3]$.

(b) $f(x,y) = y$

D is the region bounded by $y = 4$, $y = \ln(x)$, and $y = x - 1$.