Math 126 G - Spring 2019
Midterm Exam Number Two
May 23, 2019

Name: ______________________ Student ID no. : ______________

Signature: ____

1	9	
2	12	
3	10	
4	12	
5	8	
6	9	
Total	60	

- This exam consists of **six** 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 80 minutes to complete the exam.

1. Consider the function

$$f(x, y) = xy^2 + \sqrt{y - x} - e^{x-2}.$$

(a) **[6 points]** Write the linearization $L(x, y)$ for f at the point $(2, 3)$.

(b) **[3 points]** Use your answer from part (a) to find an *approximate* solution to

$$9.61x + \sqrt{3.1 - x} - e^{x-2} = 19.1.$$

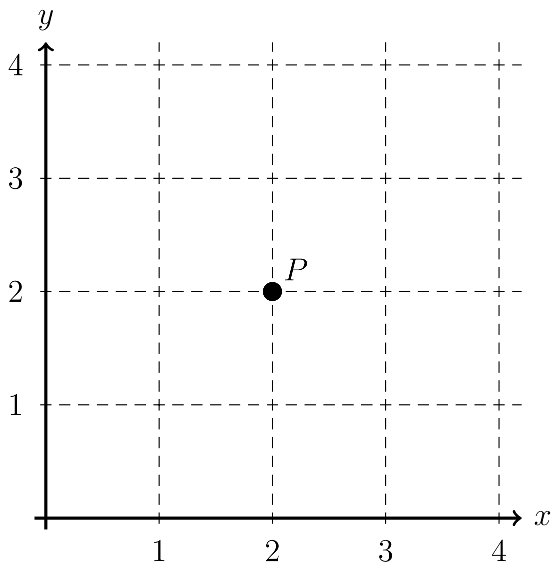
2. **[3 points each]**

Due to budget cuts, you'll have to draw your own graphs for this problem.

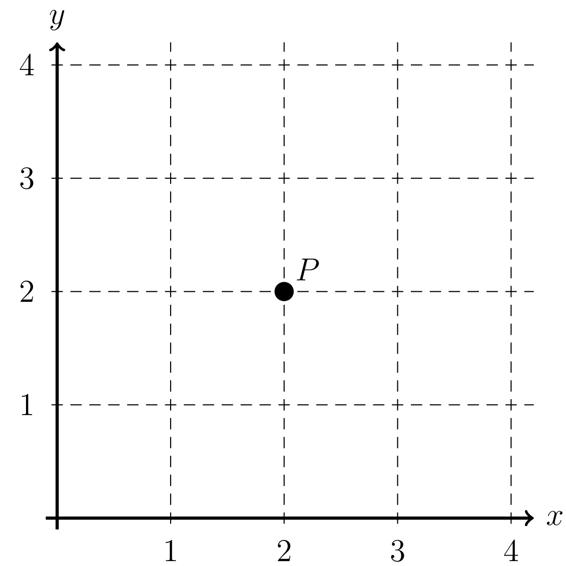
For each part (a)–(d), draw some level curves for a surface $z = f(x, y)$ satisfying the given conditions at the point $P = (2, 2)$. (Assume f is a continuous and differentiable function.)

In order to get full credit, you must draw enough level curves *and label them* so that I can actually see the indicated features in the graph.

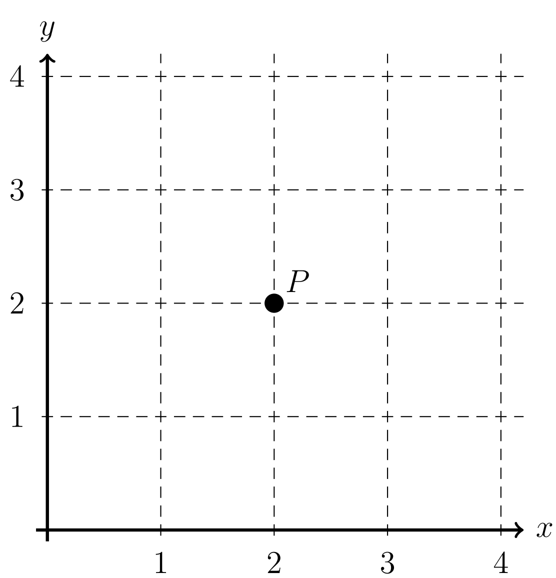
(a) There's a local minimum at P.



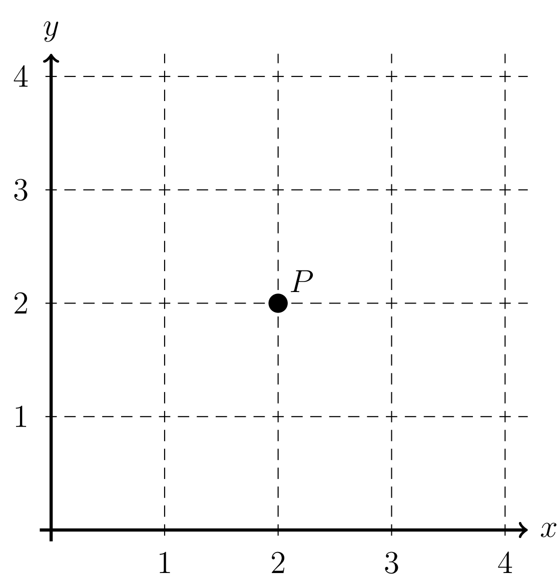
(b) There's a saddle point at P.



(c) $f_x(P) = 2$, and $f_y(P) = -1$.



(d) $f_x(P)$, $f_y(P)$, $f_{xx}(P)$, and $f_{yy}(P)$ are all positive.



3. **[10 points]** Find the points on the hyperbolic paraboloid $x = z^2 - y^2$ that are closest to the point $(1, 3, 0)$.

   For full credit, you must justify your answer!

4. **[6 points per part]** Happy Thursday! Please evaluate these integrals.

(a) $\int_0^3 \int_4^5 y \sin(xy)\, dy\, dx$

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

5. **[8 points]** Let R be the region in the first quadrant inside the circle $(x-2)^2 + y^2 = 4$ and outside the circle $x^2 + y^2 = 4$. Compute

$$\iint_R 3y\, dA.$$

6. **[9 points]** A lamina is in the shape of a triangle with vertices $(0,0)$, $(0,2)$, and $(2,4)$, with density proportional to the distance to the x-axis.

   Find the center of mass of the lamina.