

Quiz Ten

Lecture: 8:30 **SI:** Alex Ashley
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No notes. Calculators are allowed.

Write clearly and explain your reasoning.

1 (8 points) Suppose $f(x, y) = x^3 + 3y^2 - 12xy + 13$.

(a) (4 points) Find all the critical points of the function $f(x, y)$.

(b) (4 points) Classify each of the critical points you found in part (b) as a local maximum, a local minimum, or a saddle point. Recall that the tests are: at the critical point,

- if $D > 0$ and $f_{xx} < 0$, then the critical point is a local maximum;
- if $D > 0$ and $f_{xx} > 0$, then the critical point is a local minimum;
- if $D < 0$, then the critical point is a saddle point.

- 2 (6 points) A company is making two products. The demand functions are given by

$$p_1 = 20 - x \quad \text{and} \quad p_2 = 24 - 2y$$

where x and y are given in thousands of units and the prices p_1 and p_2 are in thousands of dollars. The joint cost function is given by $C(x, y) = x^2 + 4xy + 2y^2$. Find the maximum possible profit.

Hint: Recall that profit is revenue minus cost: $P = R - C$.

- 3 (6 points) Find the normal system that you would use to solve for the line $y = mx + b$ that is the least squares best fit to the data

$$(1, 1) \quad (3, 4) \quad (5, 6) \quad (7, 6).$$

You do not need to solve for m and b ! Just set up the system!