MATH 126 MATHEMATICS II **Name:** (please print) _____

Quiz Ten

Lecture: ☐ 8:30 ☐ 9:30

SI: ☐ Alex ☐ Ashley ☐ Avni ☐ Becca ☐ Jason ☐ Matt

No notes. Calculators are allowed.
Write clearly and explain your reasoning.

1 (8 points) Suppose $f(x, y) = x^3 + 2y^2 - 6xy - 14$.

(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

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

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 $C(x, y) = 2x^2 + 4xy + y^2$. 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

$$(0, 2) \qquad (2, 5) \qquad (4, 6) \qquad (6, 7).$$

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