

Quiz 2

NAME:

Question 1.(5 POINTS.) FIND LOCAL EXTREMA OF $f(x, y) = x^3 - 3xy^2 + 6y^2$.

STEP 1: CRITICAL POINTS: $(0, 0)$, $(2, 2)$, $(2, -2)$ GOT BY SOLVING

$$\begin{cases} f_x(x, y) = 3x^2 - 3y^2 & = 0 \\ f_y(x, y) = -6xy + 12y & = 0 \end{cases}$$

STEP 2 & 3: SECOND-ORDER PARTIAL DERIVATIVE TEST FOR CRITICAL POINT.

FOR $(0, 0)$, TEST FAILS.

FOR $(2, 2)$, SADDLE POINT.

FOR $(2, -2)$, SADDLE POINT.

Question 2.(5 POINTS.) LET $f(x, y) = y^2 - x^2$.

(A) DESCRIBE OR GRAPH THE CROSS SECTIONS OF THE SURFACE $z = f(x, y)$ PRODUCED BY CUTTING IT WITH PLANES $x = 0$ AND $y = 0$.

(B) IS POINT $(0, 0)$ A LOCAL MINIMA POINT, MAXIMA POINT OR SADDLE POINT? WHY?

(A) ON PLANE $x = 0$, THE CURVE IS $z = y^2$, WHICH IS PARABOLIC UPWARD; ON PLANE $y = 0$, THE CURVE IS $z = -x^2$, WHICH IS PARABOLIC DOWNWARD.

(B) SADDLE POINT.