Taker Name: Key GTID: 903 Section:

Grader #1: GTID: 903

§14.7: Optimization and critical points

Find all the critical points of the function.

$$f(x,y) = x^3 + y^3 + 3x^2 - 6y^2 - 9x$$

Find $\nabla f = \begin{bmatrix} f_x \\ f_y \end{bmatrix}$ & set $\nabla f = \begin{bmatrix} 0 \\ 0 \end{bmatrix}$.

① $f_x = 3x^2 + 6x - 9 = 0$

② $f_y = 3y^2 - 12y = 0$

From ①

$x^2 + 2x - 3 = 0$

$\Rightarrow (x+3)(x-1) = 0$

So $x = -3$ or $x = 1$

From ②

$3y^2 - 12y = 0$

$\Rightarrow 3y(y-4) = 0$

So $y = 0$ or $y = 4$.

Since ① & ② must both be true, but the equations don't have any common variables, all pairs are possible solns.

There are four crit points.

$(-3,0)$, $(-3,4)$, $(1,0)$, and $(1,4)$

A		
J		
N		
A		
J		
N		
A		
J		
N		