
Math - 1

Part 1:

- (a) Find the critical points of the function
- (21 points)**

$$f(x, y) = 2x^3 - 3x^2y - 12x^2 - 3y^2$$

- (b) Determine their type (i.e., local minimum, local maximum, saddle point).
- (21 points)**
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- (c) Are there any global minimum or global maximum?
- (10 points)**

Show your analytical work for full credit.

Part 2:

- (a) For what value of the parameter
- a
- will the two planes

$$ax + 3y - 4z = 2, \quad x - ay + 2z = 5$$

be perpendicular? Show your analytical work for full credit. **(16 points)**

- (b) Find a vector that is parallel to the line of intersection of the two planes

$$x - y + 2z = 2, \quad 3x - y + 2z = 1$$

Show your analytical work for full credit. **(16 points)**

- (c) Find the angle between the vectors
- $\vec{v} = [1, -1, 2]$
- and
- $\vec{w} = [1, 3, 0]$
- .

Show your analytic work for full credit. **(16 points)**