

quiz 2

math222, calculus III summer 2025

Justify all your claims rigorously. Allotted time is 1 hour.

1. Let $n \geq 3$. Show by a direct computation that the function $f : \mathbb{R}^n \setminus \{\vec{0}\} \rightarrow \mathbb{R}$ defined by

$$f(x_1, \dots, x_n) = \frac{1}{(x_1^2 + \dots + x_n^2)^{\frac{n}{2}-1}}$$

satisfies the partial differential equation

$$\sum_{i=1}^n \frac{\partial^2 f}{\partial x_i^2} = \frac{\partial^2 f}{\partial x_1^2} + \dots + \frac{\partial^2 f}{\partial x_n^2} = 0.$$

2. Find the critical points of the function

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

and determine if the critical points are minima, maxima or saddle points.