Calculus I, Fall 2013

Quiz 3

Nov 14, 2013

Show all details.

1. Prove that Rolle's Theorem implies the Mean Value Theorem. (Need not prove Rolle's Theorem)
2. If $f(x)$ is a differentiable function for all $x \in R$ and $\frac{df}{dx} = (x-1)(x-2)^2(x-4)$. Find all x, if any, where f attains a local minimum or a local maximum.
3. Find $\lim_{x\to\infty} (\frac{x+2}{x-1})^x$.
4. A light ray travels from $(0,1)$, gets reflected at some point $(x,0)$ on the x-axis and arrives at $(3,2)$. According to Fermat's principle, the point of reflection is chosen to minimize the total travel distance $(0,1) - (x,0) - (3,2)$ (since the light speed c is assumed to be a constant on $y > 0$). Formulate this as an optimization problem, find x and explain why the answer you get is actually a global minimum.

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