

Math 250A (Fall 2009) - Quiz 2

SOLUTIONS

1. (5 points) Find the derivative. You may want to simplify first.

$$f(x) = e^{\ln \left[e^{(\pi x^2 + 3/x)} \right]}$$

The first step to solving this problem easily is to simplify the expression by utilizing properties of logarithms and exponentials. We now obtain the same function in the following form:

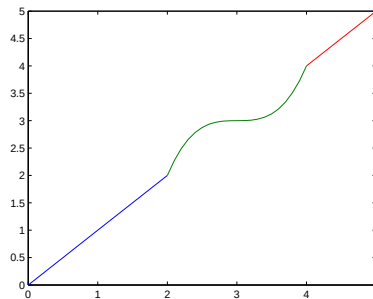
$$f(x) = e^{\pi x^2 + 3/x}$$

In order to find the derivative, we must utilize the chain rule.

$$f'(x) = e^{\pi x^2 + 3/x} \frac{d}{dx} [\pi x^2 + 3/x] = (2\pi x - 3/x^2) e^{\pi x^2 + 3/x}$$

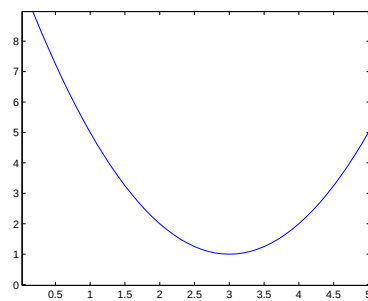
2. (5 points) Assume f is differentiable and has just one critical point, at $x = 3$. You are given additional conditions for two different cases. In each case decide whether $x = 3$ is a local maximum, a local minimum, or neither (and circle the correct choice). Sketch possible graphs for both cases that clearly shows your reasoning.

- (a) $f(1) = 1, f(2) = 2, f(4) = 4, f(5) = 5$



As we can see in the graph, the function increases from the left before levelling off at the critical point at $x = 3$. The function then continues to increase afterwards. Therefore, $x = 3$ is **neither a local maximum nor a local minimum**.

(b) $\lim_{x \rightarrow \infty} f(x) = \infty$ and $\lim_{x \rightarrow -\infty} f(x) = \infty$



Since the function increases without bound as x approaches both negative and positive infinity, we can assume that $x = 3$ is a **local minimum**.