

Math 1a – Quiz 8

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1. (1 point) True or false: If $f(x)$ is a twice differentiable function and $f''(c) = 0$, then f has an inflection point at $x = c$.

2. (2 points) Evaluate the following limits.

(a) $\lim_{t \rightarrow 1} \frac{\ln t}{(t - 1)^3}$

(b) $\lim_{\theta \rightarrow \pi} \frac{\sin(\theta/2)}{\theta}$

3. (4 points) Let $p(x) = -x^4 + 18x^2 - 12$.

(a) For what values of x is $p(x)$ increasing?

(b) For what values of x is $p(x)$ concave down?

4. (5 points) Consider the function $f(x) = 3^x + x^3$.

(a) Show that $f(x)$ has *at most* one zero.

(b) Use the Intermediate Value Theorem to show that $f(x)$ has *at least* one zero.

(c) Show that $f(x)$ has *at most* two zeroes.

(d) How many zeroes does $f(x)$ have?

5. (3 points) You're cruising down I-5 between San Francisco and Los Angeles, where the speed limit is 70 miles per hour. At 3 pm, a police officer notes your position and license plate number and enters it into a database. Three hours later, a different police officer spots you 240 miles farther south, looks up your information, and pulls you over. Use the Mean Value Theorem to explain why you are getting a speeding ticket even though neither officer caught you going over the speed limit. (Hint: a graph of your position versus time might be helpful. Don't assume you traveled at a constant speed!)