NAMEs: MATH 151, Fall 2017 Section:

QUIZ 9 (GROUP WORK)

GOOD LUCK

- Show all your work and indicate your final answer clearly. You will be graded not merely on the final answer, but also on the work leading up to it.

+3 for trying +0 for not.

1. (3pts) Let $f(x) = \cot(x)$. Show that there is no value c in the interval $(-\frac{\pi}{2}, \frac{\pi}{2})$ such that $f'(c) = \frac{f(\frac{\pi}{2}) - f(-\frac{\pi}{2})}{\frac{\pi}{2} - (-\frac{\pi}{2})}$ and explain why this does not contradict the Mean Value Theorem.

- First note that $\cot(x)$ is <u>not continuous</u> on $(-\frac{\pi}{2}, \frac{\pi}{2})$, so MVT doesn't ~~exist~~ apply.
- Try to find c anyway! Plug $f(x)$ into formula so

$$f'(c) = -\csc^2(x) = -\frac{1}{\sin^2(x)} = 0, \text{ so no } c \text{ exists}$$

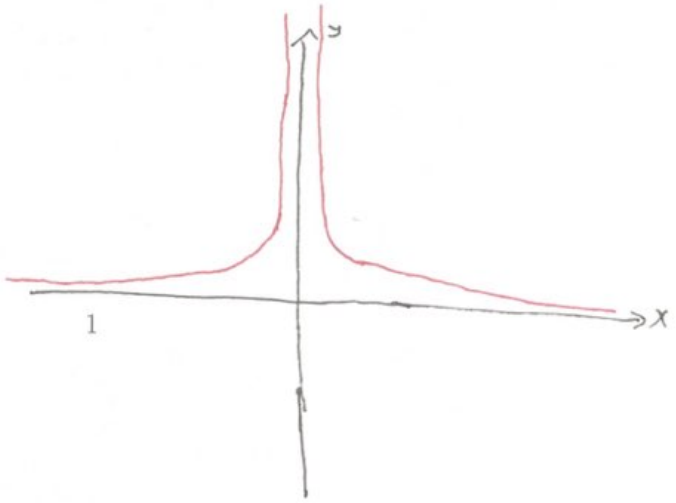
but this does not contradict MVT because $\cot(x)$ isn't continuous in interval.

2. (4pts) Sketch the graph of $f(x) = e^{\frac{1}{x^2}}$.

- Note that as $x \to 0$, $e^{\frac{1}{x^2}} \to \infty$,

as $x \to \pm\infty$, $e^{\frac{1}{x^2}} \to 0$.

+4 for correct graph



3. (3pts) Compute $\lim_{x\to 1} \frac{x}{x-1} - \frac{1}{\ln(x)}$.

- $\frac{x}{x-1} - \frac{1}{\ln(x)} = \frac{x\ln(x) - x + 1}{(x-1)\ln(x)}$ +1

- Note that at $x = 1$, we get form $\frac{0}{0}$, so we can use L'Hopital's rule.

- $\lim_{x\to 1} \frac{x\ln(x) - x + 1}{(x-1)\ln(x)} = \lim_{x\to 1} \frac{\frac{d}{dx}(x\ln(x) - x + 1)}{\frac{d}{dx}((x-1)\ln(x))}$

$= \lim_{x\to 1} \frac{x\ln(x)}{\ln(x) + x - 1}$ +1

L'Hopital's again $= \lim_{x\to 1} \frac{1 + \ln(x)}{1 + \frac{1}{x}}$

$= \frac{1}{2}$.] +1