Math 311 Section 05 # Quiz 9 Fall 2018

Name: ____

1. (1 point) __**T**__ True or False: If f and g are differentiable, then so is $f + g$.

2. (1 point) __**T**__ True or False: A monotone sequence of real numbers is convergent if and only if it is bounded.

3. (1 point) __**F**__ True or False: Let $f : \mathbb{R} \to \mathbb{R}$. If $\{x_n\}$ is some sequence in $\mathbb{R}$ converging to x_0 such that the sequence $\{f(x_n)\}$ converges to L, then

$$\lim_{x \to x_0} f(x) = L.$$

4. (1 point) Complete the statement of the Intermediate Value Theorem below:

Theorem 0.1 (Intermediate Value Theorem)**.** *Let $f : [a, b] \to \mathbb{R}$ be continuous. If L is a real number satisfying $f(a) < L < f(b)$ or $f(a) > L > f(b)$, then*

Solution: there exists a $c \in (a, b)$ such that $f(c) = L$.

5. (1 point) Identify the error in the following proof that $\forall n \in \mathbb{N}$,

$$1 + \cdots + n = \frac{n(n+1)}{2}$$

Proof. Suppose $1 + \cdots + n = \frac{n(n+1)}{2}$ for some $n \in \mathbb{N}$. Then,

$$\begin{aligned} 1 + \cdots + n + 1 &= 1 + \cdots + n + n + 1 \\ &= \frac{n(n+1)}{2} + n + 1 \\ &= \frac{n(n+1) + 2(n+1)}{2} \\ &= \frac{(n+1)(n+2)}{2}. \end{aligned}$$

Hence, by mathematical induction, the result holds for all natural numbers. □

Solution: The author did not include the base case.