MAS241 - Analysis I

Quiz 3 - May 7, 2019

Student ID: Name:

Correct answer - 5 points
No answer - 2 points
Wring answer - 0 points

In the following questions, every function is a real-valued function defined on a subset of $\mathbb{R}$.

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1.	If $\lim_{x\to p} f(x) = q$, then $\lim_{n\to\infty} f(p_n) = q$ for every sequence $\{p_n\}$ such that $\lim_{n\to\infty} p_n = p$. (False. Consider the sequence $p_n = p$.)	☐	☐
2.	A function f is continuous if and only if $f^{-1}(E)$ is closed for every closed set $E \subset \mathbb{R}$. (True. See Corollary of Theorem 4.8.)	☐	☐
3.	Any uniformly continuous function is bounded. (False. Consider $f(x) = x$ on $\mathbb{R}$.)	☐	☐
4.	If f is continuous and E is a connected subset of $\mathbb{R}$, then $f(E)$ is connected. (True. See Theorem 4.22.)	☐	☐
5.	There exists a monotonically increasing function on (a, b) that is discontinuous at infinitely many points. (True. See Remark 4.31.)	☐	☐
6.	If f is monotonically increasing and differentiable in (a, b), then $f'(x) > 0$ for all $x \in (a, b)$. (False. Consider $f(x) = x^3$ on $(-1, 1)$.)	☐	☐
7.	If f has a local maximum at x, then $f'(x) = 0$. (False. The derivative may not exist at the local maximum.)	☐	☐
8.	If $\lvert f(x) - f(y)\rvert \le (x - y)^2$ for any $x, y \in \mathbb{R}$, then f is constant. (True. It can be shown that $f'(x) = 0$ for any $x \in \mathbb{R}$.)	☐	☐
9.	If f is differentiable on $[a, b]$, then f' cannot have discontinuities of the first kind on (a, b). (True. See Corollary of Theorem 5.12.)	☐	☐
10.	If f is defined on (a, b) and $f^{(n)}(x)$ exists for a point $x \in (a, b)$, then $f^{(n-1)}(t)$ exists in some neighborhood of x. (True. See the remark below Definition 5.14.)	☐	☐