MAT 319/320: Basics of Analysis, Spring 2019
Homework Assignment 2

Please read Sections 7-9 of Ross's textbook thoroughly.

Optional supplemental reading for MAT 320: Rudin's book, pp47–51

Problem Set 2 (**due before the start of recitation on Wednesday, February 13th**): 7.1d, 7.2, 7.4, 8.1d, 8.5, 8.8b, 9.1b, 9.3, 9.9, 9.11a, and Problem A* below
* Problem A *must* be answered on a printout of this sheet

Problem A

Here are several "mixed-up" versions of the condition for convergence of a sequence $(s_n)_{n\in\mathbb{N}}$.

(1) There exists a real number s such that for every $\epsilon > 0$ and every $n \in \mathbb{N}$, $|s_n - s| < \epsilon$.
(2) There exist real numbers s and $\epsilon > 0$ such that for all $n \in \mathbb{N}$, $|s_n - s| < \epsilon$.
(3) There exist a real number s and integer $N > 0$ such that for all $\epsilon > 0$ and $n > N$, $|s_n - s| < \epsilon$.
(4) There exists a real number s such that for every $\epsilon > 0$, there exists $N > 0$ such that for $n > N$, $|s_n - s| < 100\epsilon$.
(5) For every real number s, there exists $\epsilon > 0$ such that for all $n \in \mathbb{N}$, $|s_n - s| < \epsilon$.
(6) For every real number s, there exists $\epsilon > 0$ and $n \in \mathbb{N}$ such that $|s_n - s| < \epsilon$.
(7) For every real number s and for every $\epsilon > 0$, there exists $n \in \mathbb{N}$ such that $|s_n - s| < \epsilon$.
(8) For every real number s and every $\epsilon > 0$, there exists $N > 0$ such that for $n > N$, $|s_n - s| < \epsilon$.

Which conditions above are equivalent to boundedness? (__)   (__)

Which condition above is equivalent to convergence? (__)

Which condition above is satisfied by *every* sequence of real numbers? (__)

Which condition above is satisfied by no sequence of real numbers? (__)

For each of the three remaining conditions, give a simpler description in your own words of what the condition tells you about the sequence s_n.

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