Real Analysis

Math 310 MWF 10:30-11:25am
Fall 1996 127 Fowler

Ron Buckmire ~ 402 Fowler ~ 259-2536 ~ ron@oxy.edu ~ Mon 1:30-3:30pm Wed & Thu 1:30-2:30pm

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Wednesday (10/02/96)

SUMMARY Review for Exam 1 / More on Monotonic Sequences

READING §10

Warm-Up
(5-10 minutes) We'll review the Mock Exam together

Connections
Let's try and find the connections between our classifications of sequences. Let (s_n) be a sequence of real numbers. Consider the following statements about (s_n) and write down which of the statements [(a)-(g)] must be true for each numbered statement:

1. (s_n) is bounded $\Rightarrow$
2. (s_n) is unbounded $\Rightarrow$
3. (s_n) is convergent $\Rightarrow$
4. (s_n) is montone $\Rightarrow$
5. (s_n) is montone and bounded $\Rightarrow$
6. (s_n) is montone and unbounded $\Rightarrow$

Write down a sequence and determine whether it is

(a) (s_n) is BOUNDED

(b) (s_n) is NONDECREASING

(c) (s_n) is NONINCREASING

(d) (s_n) is CONVERGENT

(e) (s_n) is DIVERGENT

(f) (s_n) has NO LIMIT D.N.E.

(g) (s_n) is UNBOUNDED

SOME USEFUL THEOREMS

Let's quickly go through the proofs of these theorems from the previous class

Theorem 10.2: If (s_n) is a *bounded, nondecreasing* sequence, then s_n converges.

Theorem 10.4: If (s_n) is an *unbounded, nondecreasing* sequence, then $\lim s_n = +\infty$. If (s_n) is an *unbounded, nonincreasing* sequence, then $\lim s_n = -\infty$.

Exam 1 Review

- Peano Postulates
- Natural, Integer, Rational and Real Numbers ($\mathbb{N}$, Z, Q, R)
- Algebraic Numbers and Rational Zeroes Theorem
- Field Axioms
- Maximum, Minimum, Lower Bound and Upper Bound
- Infimum and Supremum
- $+\infty$ and $-\infty$
- Completeness Axiom (For a set $S \subset \mathbb{R}$ which is bounded above, $\sup S$ exists)
- Sequences
- Formal Definition of Convergence of a Sequence
- Formal Proofs
- Theorems about Sequences (e.g. convergent sequences are bounded)
- Theorems on Limits of Sequences (e.g. $\lim a^n = 0$ if $|a| < 1$
- Unbounded sequences (infinite limits)
- Theorems on unbounded sequences
- Monotone sequences (i.e. nondecreasing or nonincreasing)
- Theorems on monotone sequences