

Reviewing for the Second MA 425 Test

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1. Sequences (3.5–3.6)

(a) Important notions

- i. Cauchy sequence (3.5.1).
- ii. Cauchy's convergence criterion (3.5.5).
- iii. Sequences that approach ∞ or $-\infty$ (3.6.1).

(b) Important homework problems: all assigned.

2. Limits of functions (chapter 4)

(a) Important notions

- i. Cluster point (4.1.1).
- ii. Limit of $f(x)$ at $x = c$ (4.1.4).
- iii. Sequential criterion for limits (4.1.8).
- iv. Boundedness of f on a neighborhood of c (4.2.1).
- v. Existence of limit implies boundedness on a neighborhood (4.2.2).
- vi. Limits of algebraic combinations of functions (4.2.4: ϵ - δ proofs given in lecture and homework).
- vii. $\lim_{x \rightarrow c} f > 0$ implies $f > 0$ on a neighborhood of c (4.2.9).
- viii. One-sided limits (4.3.1).
- ix. $\lim_{x \rightarrow c} f = L$ if and only if $\lim_{x \rightarrow c^+} f = L$ and $\lim_{x \rightarrow c^-} f = L$ (4.3.3).
- x. Infinite limits (4.3.5).
- xi. Limits as $x \rightarrow \infty$ or $x \rightarrow -\infty$.

(b) Important homework problems: all assigned.

3. Continuous functions (5.1–5.4)

(a) Important notions

- i. Definition of continuity (5.1.1).
- ii. Sequential criterion for continuity (5.1.3).
- iii. Dirichlet's function is not continuous anywhere (5.1.5(g)).
- iv. Algebraic combinations of continuous functions are continuous (5.2.1).

- v. Composition of continuous functions is continuous (5.2.6)
- vi. Bounded functions (5.3.1).
- vii. Boundedness Theorem (5.3.2).
- viii. Max-min Theorem (5.3.4).
- ix. Intermediate Value Theorem (5.3.6).
- x. Uniform continuity (5.4.1).
- xi. Lipschitz functions (5.4.4)
- xii. Lipschitz implies uniform continuity (5.4.5).

(b) Important homework problems: all assigned.

4. Derivative (6.1–6.2)

(a) Important notions

- i. The derivative (6.1.1).
- ii. Differentiable implies continuous (6.1.2).
- iii. Derivatives of algebraic combinations of functions (6.1.3).
- iv. Chain rule (6.1.6).
- v. Mean Value Theorem (6.2.4).

(b) Important homework problems: all assigned.