

# Reviewing for the Second MA 425 Test

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## 1. Sequences (3.4–3.6)

### (a) Important notions

- i. Subsequences (3.4.1, 3.4.2).
- ii. Bolzano-Weierstrass Theorem (3.4.8).
- iii. Cauchy sequence (3.5.1).
- iv. Cauchy's convergence criterion (3.5.5).
- v. Sequences that approach  $\infty$  or  $-\infty$  (3.6.1).

(b) Important homework problems: 3.4 #14, 3.5 #4, problems assigned Sept. 26, problem 1 assigned Sept. 30.

## 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:  $\epsilon$ - $\delta$  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 (chapter 5)

### (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.