

Math 413–Midterm Study Guide

- The midterm exam will be on Friday October 17.
- The exam will cover sections 1.3,1.4, 2.2–2.6, 3.1–3.4 and 4.2. The course web page contains a week-by-week syllabus that gives a more detailed description of the material you are responsible for.

<http://www.math.uic.edu/~marker/math413/wtow.html>

- You should be comfortable with all of the key definitions. You should be able to state, apply and sketch the proof of all of the key results. The course web page contains a list of key concepts and key results.

<http://www.math.uic.edu/~marker/math413/concepts.html>

Sample Midterm

- 1) Give complete definitions of the following concepts:
 - a) $\lim_{x \rightarrow c} f(x) = L$ where $f : A \rightarrow \mathbb{R}$;
 - b) α is the least upper bound of A ;
 - c) (a_n) is Cauchy;
 - d) $A \subseteq \mathbb{R}$ is closed.
- 2) State and prove the Monotone Convergence Theorem.
- 3) Determine if each of the following statements is TRUE or FALSE. If FALSE give an example showing that it is FALSE.
 - a) Every convergent sequence is bounded.
 - b) If (a_n) is convergent, then $\lim a_n = \sup\{a_1, a_2, \dots\}$.
 - c) If A_i is open for all $i \in I$, then $\bigcup_{i \in I} A_i$ is open.
 - d) If F is closed then every $a \in F$ is a limit point of F .
 - e) Every subsequence of a monotonic sequence is monotonic.
 - f) If (a_n) is unbounded, then every subsequence is divergent.
 - g) If $F_1 \supseteq F_2 \supseteq \dots$ are nonempty closed sets, then $\bigcap_{n=1}^{\infty} F_n$ is nonempty.
- 4) Suppose $0 < b < 1$. Prove that the sequence (b, b^2, b^3, \dots) is monotonic and converges to 0.
- 5) Suppose $A \subseteq \mathbb{R}$ and L is the set of limit point of A . Prove that L is closed.