Math 220, 2nd Midterm Exam Review

The midterm will be held in class on Tuesday March 23. Books, notes and "cheat sheets" will NOT be allowed.

The midterm will cover material from Section 10, Section 11 (only the absolute values), Section 12 and Section 13. The best ways to prepare for the midterm are to review your class notes, re-read the text material, review the homework problems, and work on other problems in the text. Below is a review of some of the key concepts and results to remember.

(1) Well-ordering property of $\mathbb{N}$
(2) Mathematical Induction
(3) Absolute values of real numbers, the triangle inequality
(4) Upper bounds of S, $\max S$, $\sup S$, lower bounds of S, $\min S, \inf S$. Important: $\max S, \min S$ must be in S; but $\sup S, \inf S$ may or may not be in S.
(5) Completeness Axiom of $\mathbb{R}$. Some of its useful consequences:

- The set $\mathbb{N}$ is unbounded in $\mathbb{R}$ (Archimedean property)
- For each $x > 0$, there is an $n \in \mathbb{N}$ such that $0 < 1/n < x$
- The equation $x^2 = p$ is solvable in $\mathbb{R}$ for each prime number p
- Density of $\mathbb{Q}$ in $\mathbb{R}$ (and density of the irrational numbers in $\mathbb{R}$)

(6) neighborhood of x, deleted neighborhood of x, interior points of S, boundary points of S, closed sets, open sets, accumulations points of S, isolated points of S, $\operatorname{cl} S$. Important results:

- S is closed (open) if and only if $\mathbb{R} \backslash S$ is open (closed)
- S is open if and only if every x in S is an interior point of S
- S is closed if and only if S contains all of its accumulation points
- $\operatorname{cl} S$ is closed
- S is closed if and only if $S = \operatorname{cl} S$
- $\operatorname{cl} S = S \cup \operatorname{bd} S$
- The union of any collection of open sets is open, the intersection of FINITELY many open sets is open
- The intersection of any collection of closed sets is closed, the union of FINITELY many closed sets is closed