

Math 215: Introduction to Advanced Mathematics

Final–Study Guide

- The final exam will be December 14, 8:00-10:00am in 208 Taft Hall. The exam will be cumulative covering all material in the course, but will emphasize material chapters 11, 14 and 22.
- The course web page contains a week-by-week syllabus
<http://www.math.uic.edu/~marker/math215/wtow.html>
and a list of key concepts
<http://www.math.uic.edu/~marker/math215/concepts.html>
that gives a more detailed description of the material you are responsible for.
- One good way to study is to work on the sample problems suggested on the course web page.
- I will have office hours on Wednesday December 13 10-12 and 1-3. I will not be available on Monday or Tuesday of exam week.

Sample Questions

These questions focus on Chapters 11, 14 and 22. Look at the earlier sample exams and midterms to review the earlier chapters.

- 1) Define the following concepts:
 - a) \sim is an equivalence relation on X .
 - b) X and Y are equipotent
 - c) X is denumerable.
- 2) State the Pigeonhole Principle.
- 3) Sketch the proof that \mathbb{R} , the set of real numbers, is uncountable.
- 4) Decide if each of the following statement is TRUE or FALSE. If FALSE, give an example showing it is FALSE.
 - a) If A is countable, then A is infinite.
 - b) If A is infinite, then $|\mathbb{N}| \leq |A|$.
 - c) If $|X| = |Y|$ and $f : X \rightarrow Y$ is injective, then f is a bijection.
 - d) The relation $x \sim y$ if and only if $x + y$ is odd for $x, y \in \mathbb{Z}$ is an equivalence relation.

- e) If $f : X \rightarrow Y$, then $\{\overleftarrow{f}(y) : y \in Y\}$ is a partition of X .
- 5) Let $f : X \rightarrow Y$ be an injection. Let $g : Y \rightarrow X$ be the function $g(y) =$ the unique element of x with $f(x) = y$. Prove that g is a surjection.
- 6) The dyadic rationals is the set $D = \{\frac{a}{2^n} : a \in \mathbb{Z}, n \in \mathbb{N}\}$. Prove that D is countable.