Math 20630-01 : Introduction to Mathematical Reasoning Syllabus

Class: 1:55-2:45 MWF, 105 PASQ.

Webpage: http://www3.nd.edu/ rhind/20630.htm

Instructor: Richard Hind, 216 Hayes-Healy, hind.1@nd.edu.

Office hours: 3-4 MF or by appointment.

Text: John D'Angelo and Douglas West, Mathematical Thinking, second edition, Prentice Hall.

Midterm exams: In class on Wednesday February 20 and Wednesday April 3.

Final exam: Thursday May 9, 4:15pm.

Homework: This will be assigned every day, but will typically be due on Wednesdays at the start of class. Everything due on a particular Wednesday should have been assigned by the previous Friday. Early homework will be accepted but not late. At the end of the semester I'll remove your two lowest scores.

Grading:

- Homework: 100 points
- Bonus: 50 points
- Midterms: 100 points each
- Final exam: 150 points

10 bonus points will be awarded for a perfect solution to an (!) question not assigned on the regular homework, submitted anytime before the last day of class. At most one question in each chapter can earn these points, and at most 5 overall.

Brief description: As with all writing, mathematics should be presented in grammatically correct sentences and paragraphs. The difference with other fields is that any conclusions are not opinions based on convincing evidence, but are supposed to be irrefutable given our accepted rules of logical reasoning. For this to be possible we must make absolutely clear what exactly is being said, and therefore mathematical essays usually start with precise definitions. Then, in the reasoning which follows, each sentence must have a clear, unambiguous meaning, and any statements must be logically justified. In practice this means taking extreme care with quantifiers and the structure of sentences, and so we'll spend lots of time on this.

Once you become familiar with mathematical writing, you'll find that it is useful for far more than carefully justifying things you already know. The process involved in writing a careful proof is the same as that required to think about and solve a problem. We will learn to express problems precisely and then manipulate them, think about them in different ways, and finally derive (irrefutable!) solutions.

Material covered: I'll aim to cover roughly chapters 1,2,3,6,7,8,13,14,15 but can adjust this depending upon how we feel. This list of chapters covers mathematical writing and proofs together with a brief introduction to abstract algebra and analysis.