Test 3 Topics
MCS115 - Spring 2008

Section 3.1

- One-to-one correspondences, relationship to counting.

Section 3.2

- Cardinality. Definition of same cardinality.
- Examples of things that have the same cardinality as the natural numbers (naturals minus one or two numbers, evens, odds, integers, rationals, Hotel Cardinality).
- Finding one-to-one correspondences between infinite sets.

Section 3.3

- Cantor's diagonalization. The cardinality of the set of real numbers is strictly larger than the cardinality of the set of natural numbers. How to construct a Missing Number.
- Showing sets other than the real numbers have cardinality greater than the natural numbers (e.g. real numbers with just 1s and 7s, strings of heads and tails).

Section 4.1 Pythagorean Theorem

- You should know the precise statement of the Pythagorean Theorem. (Note: $a^2 + b^2 = c^2$ is not good enough, as it requires an explanation of what a, b and c represent.)
- You should understand the basic idea behind a geometric proof of the theorem. You should understand the two geometric proofs we discussed.
- You should understand applications of the Pythagorean Theorem similar to the homework problems.

Section 4.3 Golden Rectangle

- You should know the definition of a golden rectangle and you should know that the golden ratio is exactly $\frac{1+\sqrt{5}}{2}$ and approximately 1.618.
- You should know that the golden ratio satisfies the following relationships: $\phi^2 = \phi + 1$ and $\phi = \frac{1}{\phi - 1}$.
- You should be able to determine whether or not a given rectangle is a golden rectangle.
- You should understand how removing the largest square leaves a golden rectangle.
- You should understand how to construct a golden rectangle from a square, and variants on that construction, as in the homework problems.

Section 4.5 Platonic Solids and Duality

- Definition of regular solids, examples, table on page 275
- Characteristics of any Platonic (regular) solid:
  - Each face is the same regular polygon.
  - Every vertex has the same number of edges emanating from it.
- duality: what's dual to what? How are the number of faces, vertices and edges related between a solid and its dual?