

Test 3 Study Sheet

Math 100 – Spring 2003

You should look over the sections from the book that were covered, your notes from class, and the assignments that were given since Spring Break. You might also like to look over the first two tests to remind yourself of my style of test-writing. Here is a list of topics covered that you can use to help you make sure don't forget something.

Infinity: Sections 3.1–3.5

1. Cardinality (definition of “same cardinality” in terms of one-to-one correspondences, relationship to counting, identifying proposed correspondences as one-to-one or showing the mistake, two kinds of mistakes that can be made)
2. Examples of things that have the same cardinality as the natural numbers (naturals minus one or two numbers, evens, odds, rationals, Hilbert's Hotel(s)/Hotel Cardinality, etc. and how to show they have the same cardinality)
3. Set of real numbers is “bigger” than set of natural numbers (diagonal proof & the missing number, why we should avoid using 9's to build the missing number, similarities to dodgeball)
4. Geometric correspondences (how to show that two geometric objects have a one-to-one correspondence between points, stereographic projection)
5. Infinity (infinity is not a number, more than one “size” of infinity, ways in which infinity does not behave like finite things)
6. Cantor's proof (subset, powerset, no largest set, diagonal proof & the missing subset, similarities to dodgeball)

Platonic Solids and Euler's Formula: Sections 4.5, 5.3

1. Platonic Solids (definition, examples, table on p. 275, how to use arithmetic to help you “count”, duality)
2. How we know there are only 5 platonic solids
3. Connected graphs (definition, examples, etc.)
4. Euler's formula: $F - E + V = 2$
 - What it means, when it applies, when it doesn't apply and how to modify it in some of these situations. (See problems 5.3.II.2-3, for example.)
 - How to prove it
 - How to use it to help you “count” faces, edges, vertices of solids

Fourth Dimension and *Flatland*: Section 4.7

1. Meaning of dimension
2. See the *Flatland* reading questions for kinds of things you should know about *Flatland*.
3. The method of analogy
4. Slices of objects in various dimensions
5. How various objects look to Linelanders, Flatlanders (A Square), Spacelanders (the sphere, you), Hyperspace-landers, etc. [slices and projections]
6. How to count faces, edges, vertices on shapes of various dimensions, including how to explain what you are doing. (We did “cubes” in class; you did “triangles” for homework (4.7.II.1).)
7. The generalization of Euler's formula that applies in higher dimensions