

# Test 3 Study Sheet

## Math 100 – Spring 2001

You should look over the sections from the book that were covered, your notes from class, and the assignments that were given since April 4. 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.

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

- Platonic Solids (definition, examples, table on p. 275, how to use arithmetic to help you “count”, duality)
- Connected graphs (definition, examples, etc.)
- 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 prove that there are only 5 platonic solids
  - How to use it to help you “count” faces, edges, vertices of solids

### 2. Fourth Dimension and *Flatland*

- Meaning of dimension
- See the *Flatland* reading questions<sup>1</sup> for things you should know about *Flatland*.
- The method of analogy
- Slices of objects in various dimensions
- How various objects look to Linelanders, Flatlanders (A Square), Spacelanders (the sphere, you), Hyper-space Landers, etc.
- How to count faces, edges, vertices on shapes of various dimensions (We did “cubes” in class; you did “triangles” for homework (4.7.II.1).)

### 3. Topology – Contortions of Space: 5.1-5.2

- What does it mean to say that mathematics is *abstract*?
- Locally Euclidean spaces and their dimension, boundaries
- Meaning of equivalent by distortion
- How to show things are equivalent by distortion (by drawing pictures or describing the distortion)
- How to show things are not equivalent by distortion (usually by find a property one has and the other does not that would be preserved by distortions).
- Some important shapes: spheres of various dimensions, torus (donut), Möbius band, Klein bottle
- Edge identification diagrams (rectangles with labeled edges that represent 2-dimensional surfaces)
  - How they work
  - How to make them for the Möbius band, torus, Klein bottle
  - How to use them to determine things about the shape they represent
  - How to represent 2-dimensional surfaces with labeled rectangles

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<sup>1</sup><http://www.calvin.edu/~rpruim/m100/S01/hw/Flatland.html>