Visualizing Mathematics Modules

1   (Dis)Orientation—Getting Started

We wish to break stereotypes of what mathematics is. Sometimes experience in K–12 is too limited, and confined to a "rush toward calculus" process. So we begin with a push to change our orientation towads mathematics,encounter some elements in the wide range of math, and at the same time become acquainted with tools for visualization.

1.1   Module Resources

1. *Mathematical Snapshots*, by Hugo Steinhaus.

2. Web resources on visualizing mathematics and connections between math and art. See some examples on the course website.

3. Free software to download and install.

   - GeoGebra, `http://www.geogebra.org/cms/en`
   - OpenSCAD, `http://www.openscad.org`
   - POV-Ray, `http://www.povray.org`
   - SketchUp, `http://www.sketchup.com`

4. Mathematical tools for describing three-dimensional structures, to be introduced in class.

5. Optional readings. See the list of interesting books on the course website. In particular, look at anything by Martin Gardner.

1.2   Tasks

1. *Mathematical Snapshots.* Look through the entire book, starting with the Foreward. This is a classic, enduring text by an eminent mathematician seeking to open a new

window into the beauty and range of mathematics. Read at least one chapter of interest to you in detail. Do not expect to fully comprehend eveyrthing in the chapter. Be prepared to engage in class discussion about how Steinhaus attempts to help the reader visualize some new or unfamiliar mathematics. Select some of your favorite examples to share—if you are ambitious you might want to consider making a simple physical or virtual model. Write 1–2 pages in which you select and discuss one particular "snapshot" that is new and interesting to you. What intrigued you about it? How did the author attempt to convey the idea?

2. Start exploring websites associated with visualizing mathematics. If you find something particularly interesting to you, be prepared to share it with the class.

3. If you have your own computer, install the software listed above. Start playing with SketchUp, GeoGebra, and OpenSCAD on your own. Bring examples to class. Can you use these to model anything from your readings or web explorations?

1.3 Product

Create an interesting and attractive "mathematics still life" with POV-Ray, suitable for display (though it need not be overly complicated). Provide both the source file and the image. Include a title and a paragraph description.