

## ACCESS 2005

### Week 4 Assignment

#### Part I: Making fractals:

(1) Reconstruct a fractal: For one of the interesting fractals in the class notes or on our web page, reconstruct the affine maps from the mapping L-picture. Check your work with the TESTMAP procedure, and when you get the template right regenerate your fractal. (Depending on which fractal you choose, you may find that you need to do some fine-tuning of the parameter values to get the fractal as nice as you would like.) Explain how you use the L-diagram to reconstruct the parameter values of the affine transformations; explain this reconstruction in detail for just one of your transformations. This explanation may be inserted as text into your maple fractal file.

(2) Make an original fractal: perhaps you have a shape you want to create, or maybe you want to see what kind of fractal you get from an interesting template. Experiment! Make something that you would be proud to have in the on-line art gallery. If you find several fractals you really like please send them to us, but one will suffice.

#### Part II: Power laws and the Body Mass Index:

(3) Find the power law which best fits our height-weight data, by starting with the **bmi.mws** file on our home page, importing the ACCESS height-weight data from the appropriate link, and reworking the calculations. As necessary change both the text and command details, in order to create a document which explains and shows the power law you derive. Add to this document a **single** display which includes the following items:

(a) our class height-weight data points

(b) the graph of the power law function you found

(c) the graph of the power law function which was obtained from the national data, in the **bmi.mws** file.

(d) three curves which pass through the points for which BMI = 15, 20, 25.

Using this display, discuss how well the BMI seems to fit with our data, compared to the two other power laws. Focus separately on children and adults.

(4) Research BMI, and write a short (3-4 page) report on what you find. I know from two years ago that there is some great original source material hidden in Marriott Library, but in order to find it you might want to first do an internet search to find the historical name attached to the BMI index. Some interesting questions to answer are:

(a) What is the B.M.I. and how is it used?

(b) When was BMI invented, and why was the power 2 chosen?

(c) How do BMI tables and guidelines get modified for children?

(d) Can you explain the modifications you describe in (c) as artifacts related to your mathematical work in part (3)?

#### Due date and what you should email us:

Nick (korevaar@math.utah.edu) and Sarah (kitchen@math.utah.edu) should receive your work by 5:00 p.m. on Friday July 15. Each group should send a single email, with attachments for parts (1)-(4) above. For parts (1), (2), (3) above, send ".mws" attachments with the output removed - we will regenerate everything from your commands, by executing your worksheets. (For the fractal work we will first load the procedures in "Lpictures.mws."). Make sure this process will work with your files, before you send them! For part (4) you may use your favorite word processor, e.g. M.S. Word. Have fun!