CALCULATED FICTION

MATH WORKSHOP 5

October 26, 2004

You'll be working with your project seminar again this week. As always, work as a team. To keep you focused on each other, each group will only get one copy of the workshop. (You'll each get your own copy at the end.) As always, you need to turn in your own workshop, so everyone needs to understand and write down the work your group does.

Have someone in your group read the instructions aloud at the beginning of each section. Watch the clock!

FINDING AREAS (1:30p – 2:00p)

Read all the way through these instructions before you start this section.

From having them drilled repeatedly into your head, you probably remember various formulas for the areas of plane figures. For example, the area of a rectangle is its length times its height. Whoopee.

In this part of the workshop, though, you have to forget all that. On the other handout, there are some plane figures: a parallellogram, a triangle, and a circle. Your task here is to find their areas WITHOUT using formulas. You're allowed to use the formula for the area of a rectangle: $A = \ell \times w$. You can use other formulas **only** if you derive them from this one.

As you work on finding these areas, scissors and tape are available, should you want to rearrange parts of the figures in question.

1. Find the area of the parallellogram. How could you apply your method to other parallellograms?

2. Now find the area of the triangle. How could you apply your method to other triangles?

3. Now for the circle. Come up with at least **three** different ways to find the area of the circle. (They don't all have to be things you can actually do here in class; pretend you have whatever tools you might need at your disposal.) Now use one of your three ways to measure the area of the circle (as accurately as you can).

MU-PUZZLE (2:00p – 2:30p)

Again, read all the way through these instructions before you start this section.

In Gödel, Escher Bach: an Eternal Golden Braid, Douglas Hofstadter introduces the MIU-system. Let's spend a few minutes working with that system. Recall that we have only three symbols, **M**, **I**, and **U**, and we have the following axiom and rules:

Axiom: **MI**.

Rules:

I. If *x***I** is a theorem, so is *x***IU**.
II. If **M***x* is a theorem, so is **M***xx*.
III. In any theorem, **III** can be replaced by **U**.
IV. **UU** can be dropped from any theorem.

Hofstadter poses the following question: Can you produce **MU**? Your job here is to answer this question.

Before you begin, spend a few minutes talking about your group's approach to the problem. What do you think the answer is? Does that affect how you'll go about solving the problem? Do you want to split up the labor? Maybe you should have some people work within the system, applying rules to theorems to derive other theorems, and have some other people look at the results, trying to discover patterns in the derivable theorems. Those looking for patterns may want to reread the first part of the section called "Inside and Outside the System" on pp. 36-37 of GEB.

Once you know the answer, prove it. If your answer is "yes", you should give a derivation of **MU** from the axiom **MI** (using only the four rules, of course). If your answer is "no", you should give a solid argument for why it is impossible to produce **MU** from **MI**.

RANDOMLY GENERATED FINAL PROJECT IDEAS (2:30p – 4:00p)

In this segment of the workshop, you'll randomly generate some final project ideas. This will give you practice at doing the kind of thinking that will lead to your final project proposal, and it may even give you ideas that you'll actually include in your final project.

1. MAKE A LIST OF TOPICS (20 minutes)

First, let's make a list of at least 20 mathematical ideas/concepts/subjects to work with. To come up with that list, consider each of the previous math workshops and each of the readings in turn. Try not to make the ideas you write down too general ("numbers!", "structure").

You should also think about mathematical ideas that you've encountered outside of class. You may also want to consider topics that will or may be covered in upcoming workshops and chapters from TLOM: Algebra, Infinity, Chaos, Voting Theory, Topology, Codes...

2. MAKE A TABLE (10 minutes)

Your list of topics should have at least 20 entries in it. Now make a table with the mathematical ideas going down the left-hand side. Across the top, write down the 10 ways to pick 3 of the letters a, b, c, d, e. (Why are there 10?) These letters, of course, correspond to the uses of mathematics in literature that were identified on the Final Project handout.

3. RANDOMLY GENERATED IDEA PARTY (40 minutes)

Devise a way to RANDOMLY choose one idea from the side of your table and one of the groupings from the top of your table.

Now combine your two choices. For the idea that you ended up with, and for each of the three uses you ended up with, answer this question: What does (topic) mean in terms of (use)? For

example, if the topic were Truth Tables and your uses were abd, how would you use Truth Tables as a mathematical procedure in the writing process? How would you use Truth Tables as inspiration for the style of the piece? How would you use Truth Tables to generate plot and conflict? Be as specific as you can about your ideas, and come up with something for each combination of topic and use that you ended up with.

Do this at least 5 times. That is, make your random choices 5 separate times, and answer the above question for each of the resulting combinations. On your table, indicate which combinations you considered.

4. GET SPECIFIC (20 minutes)

For at least one of your combinations from part 3, quickly generate the description that you might turn in with the corresponding final project proposal. That is, if you were doing this as your actual final project, how would you describe it? What type of piece would you write? Do your ideas suggest anything about the form your project would take?

PROJECT

Your math project for this week is to further develop your understanding of the mathematical ideas that will underlie your final project. Choose the topics that you want to include; research them enough to be specific about how you'll use them in your final project. Find the print-based sources that you'll use for your project and write a one-paragraph summary of them. Come see me or send me e-mail if you want ideas or clarification or if you just want to bounce your thoughts off somebody else. We're gonna make this the best prom *ever*!