MAT115 Test 1 (Spring 2010): Games, Fibs, Tangles, and Solids

Name:

Directions: Show your work! Answers without justification will likely result in few points. Your written work also allows me the option of giving you partial credit in the event of an incorrect final answer (but good reasoning). Indicate clearly your answer to each problem (e.g., put a box around it). FYI: 1 1 2 3 5 8 13 21 34 55 89 144 233 377 610 987 1597 2584. **Good luck!**

Problem 1: (10 pts)

a. In the "Let's Make a Deal" problem, you're given the choice of three doors. Now suppose that there are four doors, and that there are three doors behind which are deadly serpents, and one door behind which there is a million dollars. You select a door. Monty Hall shows you two other doors behind which are deadly serpents. You are invited to either switch to the fourth door, or stick with the one you selected. What do you do, and why?

b. Now suppose that there are 1000 doors: behind 999 there are deadly serpents, and behind one door there is one million dollars. You choose a door. Monty shows you 998 doors behind which are serpents, and invites you to switch or stick. What do you do, and why?

Problem 2: (12 pts) You are playing a game of Fibonacci Nim with coins. On the first move the stack has the number of coins given below. Following the best strategy from class, either find the number of coins you would take on the first move, or explain why you should offer to let the other player go first. If the other player goes first, assume that they take 7 coins. How many would you then take?

a. 89

b. 88

c. 123

Problem 3: (15 pts) Complete the following table for the five platonic solids (including the names!). Show any work below the table.

Solid Name	# of vertices	# of edges	# of faces	faces at a vertex	edges at a face
T					
C					
O					
I					
D					

Problem 4: (10 pts) Estimate how many **words** would fit on this page if it were completely filled (without overlap of characters and without margins), and spaced exactly as the words in this problem statement. You may use the rest of the test to collect data that might prove useful in carrying out this mission. You may also use other data that you know, per the dimensions of a sheet of paper, etc. You may assume that I would be filling the page, and that I would continue to type using the same style and word choice that I'm using right now in making up this test question (contractions count as two words, of course!).

Problem 5: (10 pts) Variety pack:

a. What exactly is a golden rectangle?

b. Who was Ramanujan?

c. What rule do the numbers of clockwise and counterclockwise spirals in pineapples, pinecones, etc. tend to follow?

d. What is the Pigeonhole principle?

e. Explain the concept of duality encountered in the study of the Platonic solids.

Problem 6: (10 pts) Use this grid paper and the spiral method to **carefully** create the Fibonacci spiral whose relative side lengths are 34x21. Draw the successive rectangles, and the resulting spiral.