Math 110-02, 19 February 2014

Name 1: _____

Name 2: _____

Name 3: _____

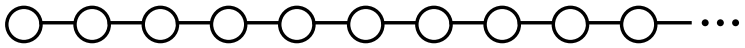
Instructions: *You should work on these questions in a group of three students. All three students' names should be at the top of this sheet. Discuss and work on each problem for about ten minutes, and write down a response to the problem in the space provided on this sheet. Explain what you discussed and what ideas you came up with. If you have some sort of solution, include it, but you don't necessarily need one. Continue your responses on the back, if necessary. This sheet is to be turned in before the end of class, and I will ask several people to present the results of their discussion. This will be graded check, check-plus, or check-minus. We might continue the presentations in class on Friday—and I will certainly ask whether you have any new ideas about the questions.*

Question 1. Even worse than the Ping-pong Ball Conundrum.

This is Exercise #37 from Section 3.2, based on the Ping-pong Ball Conundrum that we looked at in class: "This time, the ping-pong balls are not numbered! You play the same game as in our experiment, but now at each stage you just reach in and remove one ping-pong ball (you cannot fish around for a particular ball, since they now all look the same). How many ping-pong balls might remain in the barrel [after the infinitely many tasks have been completed]? This question is an interesting conundrum."

Question 2. Think like Cantor.

This is based on Exercise #13 from Section 3.3 (which has an extended hint at the back of the book): Consider the following infinite collection of circles, and consider all the different ways of coloring the circles with a red and a blue marker. This is you get to decide to make the circles red or blue. Making this decision for every circle gives *one* way of coloring the line of circles. You want to look at *all* possible colorings. Show that the set of all possible colorings has a bigger cardinality than the set of positive integers.



Question 3. Consider these questions about probability:

(a) If you roll a pair of dice, are you more likely to roll a 5 than a 3? less likely? or is the probability the same?

(b) Suppose you toss a coin 20 times and it comes up heads every time. How likely do you think it is that you will get heads again on the 21^{st} roll?

(If you think that you are finished, discuss the topic, "What is probability.")