12th Grade Assignment – Week #22

Announcement:

- Once again, I implore you to watch the lectures and do the reading assignments before the group meetings so that the discussions can be fruitful.
- Please be sure that you have a scribe from your group email notes to the tutor after the meeting concludes.

Individual Work

- Read *Mathematics as an Art* by John Williams Navin Sullivan before Tuesday's group meeting.
- Read *Mathematics and the Metaphysicians* by Bertrand Russell before Thursday's group meeting.

Group Assignments:

for Tuesday. Discuss the following questions:

- Discuss Sullivan paper. (Limit your time to 15 minutes on this topic.)
  - Have someone in the group read aloud the final paragraph in his essay.
  - What does he say that the "real function" of art is?
  - How is a mathematician different than a normal artist?
- Continuation of the Cut Plane Problem.
  - With this problem that you were given in the last tutorial session, you likely got stuck after having 4 planes (which creates 15 regions). You needed a new insight. Here it is…
  - The original question is: "Ten random planes divide space into how many regions?"
    We will now change the question to something much easier to work with, by doing this:
    We will reword the question so that everything is reduced by one dimension, and then solve that question. Here's the new question: "Ten random lines divide the plane (page) into how many regions?"
    Go ahead and answer that question.
  - The hope is that by answering the simpler question, we will learn something new (and perhaps unexpected) which will help us answer the original (too difficult) question. But first let's ask another question by reducing the number of dimensions one more time: "Ten random points divides the line into how many regions."
  - We now have the original 3-D question, as well as questions in 2-D and in 1-D. You should now organize your results into three tables (3-D, 2-D, 1-D), with the left column giving the number of cuts, and the right column giving the number of resulting regions. What do you now notice? Can you now solve the original 3-D question for ten planes?

for Thursday.

- Discuss:
  - What did you think about Cantor's proof (from lecture) that the set of rational numbers is countable?
  - Do you think that all sets of numbers (types of numbers) are "countable"?
- Discuss Russell paper.
  - Have everyone state what they thought about the paper, in general, and specifically one thing that they thought was most interesting.
  - What does Russell define math as?
  - Do you agree with this definition? Why?
  - Do you think that modern mathematicians would agree with Russell's definition of math? Why?
  - What does he mean when he says:
    - "It is not necessarily true that the whole is greater than the part."
    - "There are infinitely more infinite numbers than finite ones."
    - "There are exactly as many fractions as whole numbers."
- *Challenge!* Can you now reword the cut plane question in 4-D, and then solve it?