

12th Grade Assignment – Week #24

Announcement: Lecture #2 this week (found in the usual location) is a BBC documentary on *Fermat's Last Theorem*.

Individual Work

- Read Chapter Two of *Logicomix* before Tuesday's group meeting.
- Read both **Hahn's paper** (*The Crisis in Intuition*) and **Brouwer's paper** (*Intuitionistic Reflections on Formalism*) before Thursday's group meeting. These papers are hard to read. **This may help give the papers some context:**
 - Hans Hahn (1879-1934).
 - Hahn was a very influential mathematician of his time from the Univ. of Vienna. His article, *The Crisis in Intuition*, was published around 1930, and is actually a series of quotes from lectures he gave in the 1920's.
 - In Hahn's essay, he speaks of Immanuel Kant, who lived more than one hundred years before the time of the foundational crisis. Kant was perhaps the most influential philosopher of the 19th century, and also had a significant impact on all of the leaders of the three schools (Russell, Hilbert, Brouwer, etc.). I will speak more about Kant in next week's lectures.
 - L.E.J. Brouwer (1881-1966).
 - Brouwer was a leading mathematician and intuitionist. In his paper (*Intuitionistic Reflections on Formalism*), he speaks about the debate surrounding the *Law of the Excluded Middle*. This law, which states that a given mathematical statement must be either true or false, is a commonly used tool in proofs – especially with indirect proofs. Brouwer argues that there is a third possibility for some mathematical statements: it may be undecidable – neither provable nor unprovable. Brouwer insists that we be more careful about the use of this law. Hilbert (who was Brouwer's nemesis) responded by saying that "Taking the Principle of the Excluded Middle from the mathematician ... is the same as ... prohibiting the boxer the use of his fists."
 - His short paper (written in 1927) consists of four parts: (1) A 3-paragraph intro by the editor; (2) Brouwer gives a brief summary of his four "insights"; (3) He explains each of these insights – you can skim through this section; (4) A closing paragraph.

Group Assignments:

for Tuesday.

- Discuss the *Logicomix* reading (Chapter #2)
 1. (p87) What does he mean by saying "you are not far off the mark there!"?
 2. (p92) What is the key difference between Plato's and Aristotle's philosophy?
 3. (p96) What was Russell's newfound "actual calling"?
 4. (p94-100) How is this new logic different from logic in the past?
 5. What role did Whitehead play in BR's life?
- **Puzzle:** Infinite Hotel – Part II
(Countably) infinitely many buses arrive, each with (countably) infinitely many new guests. Each guest has a bus number and a seat number. In order to accommodate all of these new guests, what should the receptionist announce to the current guests, and to the new guests? (Follow the same rules given last week.)

for Thursday. (To be done before the above puzzles.)

- Discuss Hahn/Brouwer papers.
 1. Do you think agree with Hahn when he says that intuition is "a wholly unreliable guide" and should "complexly banished" from mathematics?
 2. Leopold Kronecker (intuitionist, 1823-1891) said, "The whole numbers were given to us by God – all else in mathematics was the creation of man." What do you think of what he said?
 3. Summarize what Brouwer says in his concluding paragraph.
 4. The intuitionists insisted that math was meaningful, and that its laws were about truth. To the formalists and logicists, math was a "meaningless game". What do you think?
- Discuss Fermat's Last Theorem Documentary:
 5. What did you like about this documentary?
 6. How does this documentary change your idea of what math is, and what it means to be a mathematician?
 7. How is being a mathematician today different and similar to being a mathematician a couple of centuries ago?
 8. What does it mean to be successful? What is the purpose of life?
 9. How do you think math ought to be taught in schools – perhaps differently than what is typically done?