

Math 629 — History of Mathematics

Fall 2000

Suggested Term Paper Topics

Each paper should be 15-20 pages typed and double spaced and fully referenced. Each student must select a different topic. (First come, first served.)

1. Examine in detail the notion of continuity from a historical perspective from the time of Newton through the time of Weierstrass. What fundamental changes have occurred in the last 150 years - if any - on continuity?
2. From as near a mathematical perspective as possible, what were the medieval notions of infinity?
item Discuss recent trends in the history of Indian mathematics
3. Select a “thread of mathematics” and trace it from its beginning to current times. OR Select a “thread of mathematics” and trace it from its beginning to its end. Analyze why it ended.
4. Describe the notion congruence by dissection. How far has it evolved? Give its history.
- 5.
6. Describe human cognitive ability at “number sense” from the work of Piaget to Dabaene
7. Trace the occurrence of paradoxes in mathematics from the Greeks to the twentieth century. Discuss several in detail with their resulting resolution vis à vis the development of mathematics — or non resolution.
8. Give a complete accounting of the translations (from Greek to Arabic to Greek/Latin/local vernacular, etc) of Euclid’s *The Elements*.
9. What contributions toward rigor did Weierstrass bring to mathematics?
10. Trace the development of iterative processes from antiquity to the great French mathematician Picard.
11. Discuss the use of permutation groups in the development of abstract algebra.
12. Give a historical account of existence and uniqueness of solutions to partial differential equations during the first half of this century.
13. Outline the history of the calculus of variations. What particular role did Euler play. What happened to the field by the early twentieth century.

14. Trace the history of attempts to solve by radicals polynomial equations of order greater than 4, beginning with Cardano and concluding with Abel.
15. Give a critique of the axioms and postulates of Euclid's geometry and more modern treatments which clarify the unwritten assumptions of Euclid. Discuss Hilbert's postulational system. Also, pay close attention to the parallel lines postulate, and what has happened in consequence (non-euclidean geometries).
16. Describe the history of modern transform theory, including the Fourier transform, the Laplace transform, and general integral kernel transform. What were the original motivations to develop them?
17. Study Issac Barrow's geometrical calculus.
18. Trace the origin and development of the three fundamental partial differential equations: the parabolic, the elliptic, and the hyperbolic. What new mathematics was developed to solve them?
19. Trace the notion of convergence from the ancient primitive concepts through the integral calculus as developed by Riemann. (Actually, this requires an examination of the notion of rigor in finding limits.)
20. Give an account of mathematics in the service of the military. Begin with Archimedes, proceed through Galileo, and up to modern times.
21. Give an history of the mathematics developed during the Second World War in the service of war.
22. Trace the development of the theory of mathematical fluid dynamics.
23. The 20th century has seen a reemergence of constructive mathematics. Give an accounting of this development. What were the issues? Why was the current development of mathematics unsatisfactory to it's proponents?
24. Trace Oresme's theory of indivisibles and infinitestimals. Include findings on his impact upon the development of calculus in the 17th century.
25. Who is Bourbaki? What is Bourbaki's impact on modern mathematics.
26. Give a historical account of Hilbert's 23 problems. How many have been solved? What are the prognoses for the others?
27. What was Descartes' philosophy? How did it change forever the way man was to think about the universe?
28. Explain in detail how Cantor developed his theory of sets. What problems did he begin with? What gains did he make? Was Cantor really insane?
29. Trace the historical thread of solvability for groups.