

2019-20 ArtsSci 1D06 Math Essay Topics

- 1) Fractals, e.g. Mandelbrot sets, Sierpinski triangles
- 2) Interesting problems involving π :
 - Buffon's needle
 - $\sum_{n=1}^{\infty} \frac{1}{n^2} = \frac{\pi^2}{6}$
 - transcendence of π
- 3) Paradoxes
 - Borel problem
 - Banach-Tarski paradox
 - Russell's paradox
- 4) Infinity
- 5) Surreal numbers
- 6) Historical developments
 - Complex numbers
 - Quaternionic numbers
 - Rigor in the foundations of calculus
 - Controversy about Euclid's 5th postulate
- 7) Non-euclidean geometry
- 8) Euclidean geometry
- 9) Twin primes conjecture
- 10) Fermat's last theorem
- 11) The Poincaré conjecture
- 12) The Riemann zeta function
- 13) Fourier series
- 14) Random Walks
- 15) Wavelets
- 16) Irrational numbers
- 17) Travelling salesman problem and P versus NP conjecture
- 18) Ptolemy's theorem and its history
- 19) Ethnomathematics and alternative number systems
- 20) Fibonacci numbers and the golden ratio in nature and art
- 21) Music and mathematics, harmonic series, ...

Procedure and timeline

December 4: Writing about mathematics

December 16: Choose topic and inform me and/or TA

January: Research the chosen topic; meet with other students working on same topic to discuss

February 13: Submit draft of essay for feedback

March 13: Final version of essay due

