MAT514 - Analysis for Teachers II - Summer II 2019

Potential Project and Presentation Ideas.

1. As many proofs as you can find of the Fundamental Theorem of Algebra.
2. Harmonic Functions
3. Conic Sections using complex analysis
4. The maximum modulus principle and the open mapping theorem for holomorphic functions.
5. Conformal Mapping and The Riemann Mapping Theorem
6. The Schwarz-Christoffel Formula and the Riemann mapping theorem
7. Complex Dynamics: Iteration of polynomials $z^2 + c$ and the Mandelbrot set.
8. Green's theorem and Cauchy's Theorem
9. The hyperbolic disk and upper half plane.
10. Interesting applications of the Residue Theorem.
11. Proof of the Cauchy Integral Formula.
12. The Prime Number Theorem.
13. Proof of a function with zero derivative being a constant.
14. Proofs from Real Analysis made easy by complex analysis.
15. Notions of Complex Analysis that appear in NYS high school math syllabi.
16. Goursat's Theorem.
17. Taylor's theorem and a converse to the Cauchy Riemann equations.
18. The concept of homotopy and how it relates to Cauchy's Theorem.
19. Solving for the zeros of a cubic, quartic, and quintic polynomial.
20. Program interesting software to help visualize any of the concepts in class.
21. Applications of complex variables to physical or engineering problems.