TJHSST COMPLEX ANALYSIS – Syllabus – Fall 2004 – Dr. Sachs

TEXT: Fundamentals of Complex Analysis for Mathematics, Science, and Engineering, by Saff and Snider, Second Edition, Prentice-Hall (1993)

COURSE OVERVIEW: The main goals of this course are to introduce the basic ideas and techniques of complex analysis. After a quick review of the algebra of complex numbers, we will investigate how a complex function of a complex variable is both similar to and different from a real function of a real variable. The important concept of analyticity and the conditions know as the Cauchy-Riemann equations will be developed. Then the main theoretical tools and ideas are developed: complex antiderivatives and contour integrals, Cauchy's theorem, Cauchy's integral formula, maximum principle, residues, and the nature of isolated singularities of complex functions. The course continues with using complex analysis to evaluate certain definite integrals. We conclude by looking at various situations involving complex mappings, in particular by looking at conformal mappings generated by fractional linear transformations and simple analytic functions, and use these to solve some boundary value problems for Laplace's equation. As well, we explore the algebra and geometry that arise from fractional linear transformations, including material from outside the text concerning the Riemann sphere viewed as a complex projective space and the description of the unit disk with the Poincare metric as an introduction to hyperbolic geometry.

GRADING: Grading will be fair and impartial. Points used as the basis of the grade will be:

Hmwk. (100 pts.); Class participation (50 pts.); Exams (300 pts.); Final exam (150 pts.).

POLICIES: The TJ Honor code is in effect at all times and students are expected to be fully aware of its requirements. Group work may be part of the course, in which case group members will truthfully report on non-contributing members. Absence from quizzes and exams must be for a valid reason and requires prior notification except in extreme circumstances.

MATERIAL COVERED

Chapter 1 (sections 1 - 6);

Chapter 2 (all);

Chapter 3 (sections 1- 3);

Chapter 4 (all);

Chapter 5 (sections 1- 7);

Chapter 6 (sections 1 - 5, 7);

Chapter 7 (sections 1- 4); Extra material on complex projective space, hyperbolic geometry