Introduction to Complex Analysis

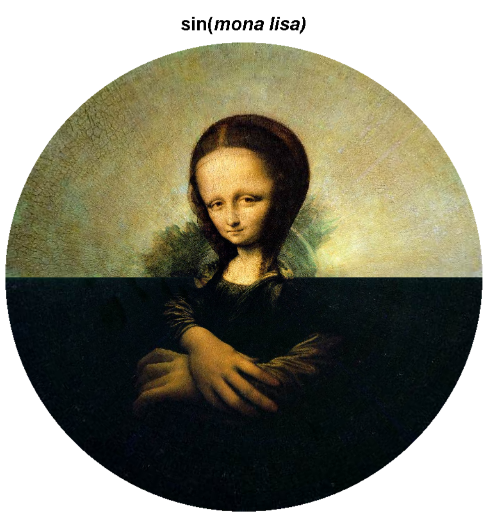
Complex numbers arise when the familiar arithmetic of the real number system is supplemented with the square root of minus one, $\sqrt{-1}$. This course will be an introduction to complex analysis, which is a specialized calculus involving functions that depend on a complex-valued variable. At the heart of complex analysis is the class of *analytic* functions that are differentiable with respect to a complex variable. The goal of this course is to understand the many amazing properties with which these complex-valued functions are endowed.

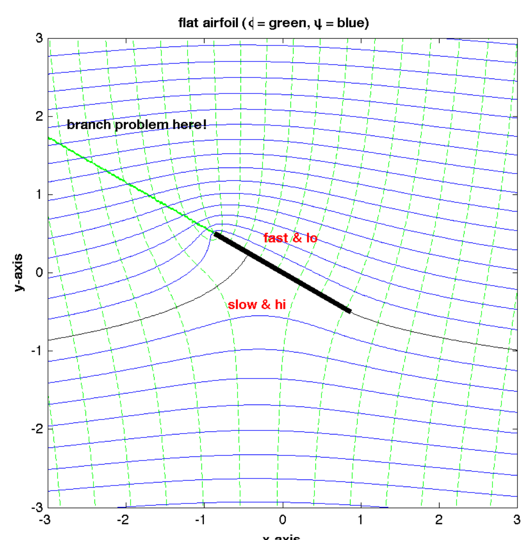
The highlights of the course will be: discussions and proofs of the elementary theorems of analytic function theory; series representations of functions; methods for evaluating complex contour integrals; and the geometry of conformal mappings. Some numerical and computer visualization will accompany the lectures and assigned work. The rudiments of numerical computing and graphics will be introduced through the use and modification of web-posted Matlab scripts and Maple worksheets.

The overlap of complex variable theory with other branches of mathematics includes: geometry & topology, number theory, and Fourier analysis. Various of these applications of complex analysis will be encountered during the term.

Course prerequisites: Math 251.

Further information & updates: www.math.sfu.ca/∼muraki





The image on the left is a graphical answer to the complex analysis question, "What is the sine of the Mona Lisa?" It is an example of a conformal map. The image on the right is a visualization of airflow past a flat airfoil (thick black) – the flow follows the blue curves in the direction from left to right. The curves are level contours obtained from a complex-valued function.