Complex Analysis I (MATH 6460)

Lab 0 - not for credit
Introduction to complex graphing

Type "http://www.math.tamu.edu/˜romwell/CGApplet/" in your browser (or just click on "Link to Complex Grapher" on the class web-page). We will use a java applet for Complex Grapher, a courtesy of Prof. Andrew Bennett, Kansas State University.

To graph of a function from $\mathbb{C}$ to $\mathbb{C}$ we need 2 complex dimensions, which is equal to 4 real dimensions. Clearly it is not possible to embed such graph into 3-dimensional space we live in. To visualize a graph of a complex functions, we will use the following trick: use three dimensions to represent real and imaginary parts of the input and the modulus of the output, and colors to represent an argument of the output. Note that we are using rectangular coordinates for the domain and polar coordinates for the range. The color reference scheme is provided on the same screen; you can see that teal color corresponds to positive real numbers (of argument 0), purple color to purely imaginary numbers with positive imaginary part (of argument $\frac{\pi}{2}$), etc. Since the argument is defined modulo 2π, using a cycle of colors makes perfect sense.

For the following list of functions, try to understand how their graphs will look like on the top view and on the side view. After that, graph the function to confirm or correct your guesses. What is the equation of the surface on the side view?

Identity function $f(z) = z$.

Constant functions $f(z) = 3$, $f(z) = -3$, $f(z) = i$, $f(z) = 1 + i$.

Modulus function $f(z) = abs(z)$.

Argument function $f(z) = arg(z)$.

Conjugation $f(z) = conj(z)$.

Real and imaginary parts (since there is no real and imaginary parts functions embedded into grapher, you will need to guess how to enter them using the library of functions provided).

Linear functions $f(z) = z + 1$, $f(z) = z + i$, $f(z) = iz$.

Square function $f(z) = z^2$.