MATH299M/CMSC389W – *Visualization Through Mathematica*
Spring 2019 – Ajeet Gary, Devan Tamot, Vlad Dobrin
Model H10.1: Poles of Complex Functions
Assigned: Monday April 1st, 2019
Due: Monday April 15th, 2019 11:59PM

Note: You must complete only 3 assignments out of Weeks 10-16, meaning you may choose to do H10.1, H10.2, both, or neither, as long as 3 in total are completed.

Now that you have Locators at your disposal, you have another tool for making interactive content. Once you start studying complex analysis you quickly learn that so-called *poles* are very important. A pole of a function is a point for which the function is *analytic* (complex version of continuous) everywhere around that point, at which the function is not analytic. We would like to look at a certain type of pole that one gets by dividing a complex function by a term of the form

$$(z - z_0)^n$$

Of course, at z_0 the function will be undefined. Your task is to create a model that plots an arbitrary function over the complex plane (perhaps plot its real and imaginary parts separately) side-by-side with the 2D complex plane complete with Locators that allow the user to add arbitrarily many poles. Observe what happens to the function.

Going further:
If you know some complex analysis, you know that what happens to contour integrals around poles is interesting. Specifically, a contour integral around an analytic region w/ no poles is 0, and around a pole you can use Green's Theorem to deduce the value of the function at that point from the value around the contour. This would be super cool to see! Although it'd be so awesome you could save it for a final project.

P.S. anything else cool you can make with Locators – show me! It doesn't have to have anything to with complex analysis. The title of this assignment in ELMS will be "Poles of Complex Functions (or whatever)".