Assignment #9

Due **Friday, June 11**

Office hours: This week Thursday office hours will be 11:00-12:00.

To do but not hand in:

p. 263, Ex. 6;

I-3;

M-7 but with $n = 3551$ and $\phi(n) = 3432$;

O-2,

P-1, P-2.

To hand in:

p. 263, Ex. 11;

O-1, O-3, O-4, O-5;

P-3, P-4.

Problem P-1. Try the complex demos linked from the course home page.

(a) For the infinite geometric series, why does the sum go crazy when the argument gets to the circle or beyond?

(b) For the exponential function, what happens to the sum when the argument is on the vertical ("imaginary") axis?

(c) For the complex analytic function, at what points is the image not "conformal" (angle-preserving when viewed with a microscope)?

Problem P-2. Let $q = p^k$, where p is a prime, and consider the three-dimensional vector space $(F_q)^3$ over F_q.

This field gives a block design in which plants correspond to 1-dimensional subspaces and blocks correspond to 2-dimensional subspaces. How many plants are there, how many blocks, and how many plants per block?

(Method: Counting 1-dimensional subspaces is like what you did before for $\mathbb{F}_p^3$; so is counting the number of 1-dimensional subspaces per 2-dimensional subspaces; and those two numbers should be enough to find the number of 2-dimensional subspaces.)

Problem P-3. Explain how to make $\mathbb{F}_8$ using congruences modulo an irreducible polynomial in $\mathbb{F}_2[x]$.

Problem P-4. Consider the grid in $\mathbb{C}$ consisting of the points $a + bi$ where a or b is an integer. Draw a picture of the image of this grid after being transformed by the map $w \mapsto (1 + 2i)w$.