Chris Bendel and Peter Cholak Math 222 - Quiz 7 Wednesday, March 17

Be sure to carefully write up your answers. It is suggested that you first write out a draft of your proposed questions and then carefully rewrite that draft to get your final version. You do *not* have to write the answers on this sheet of paper.

Problem 4 from Section 6.3.

Consider the Galois Field $F \equiv \text{GF}(3, x^2 + x + 2)$. Let α be the associated Galois imaginary.

(a) Compute all powers of α, i.e. α, α^2, α^3, ... What is the least power for which $\alpha^k = 1$?

(b) Find the inverse of each nonzero element in F. *Hint:* Use part (a).

(c) By definition α is one solution to $x^2 + x + 2 = 0$ over $\mathbb{Z}_3$. There should of course be another solution. It is also an element of F. Find this element. Is it a power of α? *Hint:* Use long division.