The final exam for this course is scheduled for Thursday, December 16, at 1:30 PM. It will be in our regular classroom. The exam will cover everything that we have done in the course. It will have two parts. The first part will be closed book and will consist of definitions, short-answer questions, and perhaps some short computations. The second part is open book; you can use your textbook, notes, and the handout on rings and fields.

My office hours for exam week are as follows:

Monday, December 13: 11:00–12:00
Tuesday, December 14: 11:00–3:00
Wednesday, December 15: 12:00–4:00
Thursday, December 16: 12:00–1:30

Here are some important terms and ideas from the rings-and-fields handout, along with some of the most important terms from earlier in the course:

- Division algorithm, \( \gcd(a, b) \)
- Relatively prime
- \( n \mod m \)
- \( D_n, \, Z_n, \, U(n), \, S_n, \, A_n, \, GL(n, R) \)
- Group
- Identity in a group
- Inverse
- Abelian group
- Symmetry group
- Subgroup
- \( |G| \) and \( |a| \)
- Cyclic group, \( (a) \)
- Subgroups of a cyclic group
- Center of a group, \( Z(G) \)
- Euler phi function
- Permutation groups
- Cycles
- Even and odd permutations
- Group isomorphism
- Automorphism
- Inner automorphism
- Cosets
- Lagrange’s Theorem
- External direct product
- \( G \oplus H \)
- Normal subgroup
- Quotient (factor) group
- Group homomorphism
- Kernel of a homomorphism
- “Normal subgroup = Kernel”
- Fundamental Theorem of Finite Abelian Groups
- Ring
- Addition, subtraction, multiplication
- Commutative ring
- Commutative ring with identity
- Zero divisor
- Integral domain
- Unit in a ring
- Field
- \( \mathbb{Q}, \mathbb{R}, \) and \( \mathbb{C} \) are fields
- \( \mathbb{Z} \) is an integral domain
- \( \mathbb{Z}_n \) is an integral domain iff \( n \) is prime
- \( \mathbb{Z}_n \) is a field iff \( n \) is prime
- Trivial ring, \( R = \{0\} \)
- Ring homomorphism
- Ideal
- Quotient ring
- Trivial ideal, \( I = \{0\} \)
- Proper ideal
- Principal ideal, \( aR \)
- Maximal ideal
- \( I \) is maximal iff \( R/I \) is a field
- \( I \) is proper iff \( 1 \not\in I \)
- Every ideal in \( \mathbb{Z} \) is principal
- The ideal \( n\mathbb{Z} \) is maximal in \( \mathbb{Z} \) iff \( n \) is prime
- Polynomial ring, \( R[x] \)
- Degree of a polynomial
- \( F[x] \) is an integral domain \( (F \) is a field\)
- Division algorithm for polynomials
- Every ideal in \( F[x] \) is principal
- Irreducible polynomial
- \( p(x) \) irreducible iff \( p(x) \cdot F[x] \) maximal
- Irreducible \( p(x) \) has a root in \( F[x]/(p(x) \cdot F[x]) \)
- \( \mathbb{C} \cong R[x]/((x^2 + 1) \cdot R[x]) \) (!)