Pries: 405 Number Theory: Spring 2020: homework

Day	Assignment
1/24	Read: Stillwell 1.6
	Vocab: what is a Diophantine equation?
	Warm-up: 1.6.3-1.6.4
1/27	Read: Stillwell 1.7
	Vocab: what is a rational point?
	Warm-up: 1.7.1-1.7.4
1/29	Read: Stillwell 1.8
	Vocab: what is a Gaussian integer?
	Warm-up: 1.8.4-1.8.6
1/31	Read: Stillwell 2.1-2.2
	Vocab: what is a gcd? (of integers, polynomials, Gaussian integers)
	Warm-up: 2.1.1-2.1.2, 2.2.1-2.2.2
2/3	Read: Stillwell 2.3
	Vocab: What is the Euclidean algorithm? (of integers, polynomials, Gaussian integers)
	Warm-up: 2.3.1
2/5	Read: Stillwell 2.4
	Vocab: What is unique factorization (of integers, polynomials, Gaussian integers)
	Warm-up: Carefully review the proof of the prime divisor property
2/7	Read: Stillwell 2.5
	Vocab: What does it mean to be prime? irreducible?
	Warm-up: Redo the irrational square roots proof for cube roots
Due 2/7	Homework assignment 1

See next page.

Day	Assignment
2/10	Read: Stillwell 2.6, 5.1
	Vocab: What is Pell's equation?
	Warm-up: 2.6.1, 2.6.2
2/12	Read: Stillwell 5.2, 5.3
	Vocab: What does it mean to have a group of solutions?
	Warm-up: 5.3.1-5.3.3
2/14	Read: Stillwell 5.4, 5.5
	Vocab: Explain the connection between solutions to Pell's equation and units in $\mathbb{Z}[\sqrt{n}]$
	Warm-up: 5.4.4, 5.4.5
2/17	Read: Stillwell 6.1, 6.2
	Vocab: What is a prime in $\mathbb{Z}[i]$?
	Warm-up: 6.2.3, 6.2.4
2/19	Read: Stillwell 6.3, 6.4
	Vocab: Why does $\mathbb{Z}[i]$ have a Euclidean algorithm?
	Warm-up: 6.3.4, 6.3.5, 6.3.6
2/21	Midterm 1

See next page.

If you feel like class is going too fast, I encourage you to spend some extra time reading.
Good sections to read are: 7.1-7.4, Chapter 10.
Write down a new thing you learned from each section.

Day	Assignment
3/2	Read: Stillwell 11.1-11.3
	Vocab: Why doesn't $\mathbb{Z}[\sqrt{-6}]$ have a Euclidean algorithm?
	Warm-up: 11.3.1-11.3.3
3/4	Read: Stillwell 11.4-11.5
	Vocab: Explain why a principal ideal in $\mathbb{Z}[\sqrt{-6}]$ needs to have the same shape as $\mathbb{Z}[\sqrt{-6}]$.
	Find a non-principal ideal in $\mathbb{Z}[\sqrt{-6}]$.
	Warm-up: 11.5.2-11.5.3
3/6	Read: Stillwell 11.6-11.7
	Vocab: Every ideal is a lattice. Is every lattice an ideal?
	Warm-up: 11.7.1-11.7.3
3/9	Read: Stillwell 11.8-11.9
	Vocab: what is the difference between unique factorization of elements and of ideals?
	Warm-up: Find an example of failure of unique factorization in $\mathbb{Z}[\sqrt{-6}]$ and fix it using non-
	Vocab: What is the main theorem connecting R/I to I being prime? being maximal?
3/13	Read: Stillwell 12.5-12.7
	Vocab: What is a class group?
Due 3/13	Homework assignment 2

See next page.

M405 Number Theory: Pries
Plans for 2 weeks after spring break

Day	Assignment
3/23	Read: project choices handout
Due 3/23	3 project choices (labeled first, second, third) Submit by e-mailing me: rachelpries@gmail.com
3/25	Read: Stillwell 5.6
	Vocab: What is a quadratic form?
	Warm-up: 5.6.1-5.6.3
3/27	Watch: Khan academy expressing a quadratic form with a matrix The link is at www.math.colostate.edu/ pries/405/405spring20/405hwsp20.html
	Vocab: What are equivalent quadratic forms?
Due 3/27	Computer lab: Week 8 Monday, continued fractions, problems 3,4,5 Week 8 Wednesday, cyclotomic fields, problems 3,4,5, extra credit 6 Week 8 Friday, elliptic curves, problems 2,3,4 Submit by e-mailing me, preferably pdf file.
3/30	Read Stillwell 8.1, 8,2, 8.3.
	Vocab: Why are quaternions good for studying sums of 4 squares?
	Warm-up: 8.2.3, 8.3.3
4/1	Read Stillwell 8.4, 8.5, 8.6
	Vocab: How are the Hurwitz integers different from $\mathbb{Z}[i, j, k]$
	Warm-up: 8.4.1, 8.5.1, 8.6.1, 8.6.3
4/3	Read Stillwell 8.7, 8.8, 8.9
	Vocab: What is the 4-square theorem? What is a number that is not a sum of 3 squares?
	Warm-up: 8.8.2
Due 4/3	Rough draft of project (see guideline list) Submit by e-mailing me pdf file

Guidelist list: these will be developed more later but you need
Topic
Motivation for Topic
Definitions and Notation
Main Theorem
Interesting examples
Data/graphs/pictures
Sources: at least 3
In the long run, this material will be put in Poster format