Homework for Math 411
Fall 2016

Textbook:
Abstract algebra, an introduction, by Thomas W. Hungerford, Third edition

Homework for week 08/31-09/09:
Due Monday 09/12

09/02 Chapter 7.1: ex 1-3(a-c-d-e)-4-6-17-18

09/07 Chapter 7.2: ex 2-4-6

09/09 Chapter 7.3: ex 14-15-19

Homework for week 09/12-09/16:
Due Monday 09/19

09/12 Chapter 7.3: ex 3-21-33

09/14 Chapter 7.4: ex 3-19-20

09/16 Chapter 7.4: ex 48

Quiz on Friday 09/16

Homework for week 09/19-09/23:
Due Monday 09/26

09/19 Chapter 7.5: ex 1-2-28

09/21 Chapter 7.5: ex 7-8-26

09/23 Chapter 8.1: ex 4-5

Homework for week 09/26-09/30:
Due Monday 10/03

09/26 Chapter 8.1: ex 10-11-18

09/28 Chapter 8.2: ex 3-11-12-31

09/30 Chapter 8.3: ex 8-13

Quiz on Friday 09/30

1st Exam on Wednesday 10/05
Covers Chapter 7 and 8.1 to 8.3
List of suggested review exercises for each chapter:

Chapter 7.1: ex 10
Chapter 7.2: ex 14-19
Chapter 7.3: ex 10-24
Chapter 7.4: ex 12-36
Chapter 7.5: ex 21-37
Chapter 8.1: ex 17-21
Chapter 8.2: ex 5-26

We will go over some of these exercises during Monday 10/03's class. **Please bring your books with you**.

Homework for week 10/07-10/14:
Due Monday 10/17

10/07 Chapter 8.3: ex 28-30

10/10 Chapter 8.4: ex 8-18-22

10/12 Chapter 8.5: ex 2-4-12

10/14 Chapter 9.1: ex 6

Homework for week 10/17-10/21:
Due Monday 10/24

10/17 Chapter 9.2: ex 2-6-14

10/19 Chapter 9.3: ex 2-4-6

10/21 Chapter 9.4: ex 1-2

Quiz on Friday 10/21
Quiz on Friday 10/28
Homework for week 10/24-10/28:
Due Wednesday 11/02

10/28 Chapter 9.2: ex 20, Chapter 9.3: ex 12, Chapter 9.4: ex 8-14

Homework for week 10/31-11/04:
Due Monday 11/07

10/31 Chapter 10.1: ex 2-4-6

11/02 Chapter 10.1: ex 10-12-26

11/04 Chapter 10.1: ex 23-28

2nd Exam on Wednesday 11/09
Covers Chapter 8.3 to 8.5, Chapter 9 and Chapter 10.1
Suggested review exercises: Chapter 8.4: ex 34, Chapter 9.1: ex 14, Chapter 9.2: ex 7, Chapter 9.3: ex 17-23, Chapter 9.4: ex 9, Chapter 9.5: ex 12, Chapter 10.1: ex 19

Homework for week 11/11-11/18:

Due Monday 11/21

11/11 Chapter 10.2: ex 6-10-15

11/14 Chapter 10.2: ex 18, Chapter 10.3: ex 6

11/16 Chapter 10.2: ex 14, Chapter 10.3: ex 12-14-20

Quiz on Friday 11/18

Homework for week 11/21-11/23:
Due Monday 11/28

11/21 Chapter 7.4: ex 37, Chapter 8.3: ex 36, Chapter 8.4: ex 38

11/23 Chapter 10.2: ex 26-30 and the following:

Supplementary exercise:
Let x and y be integer solutions of the equation

$$x^3 = y^2 + 1 = (y+i)(y-i)$$

1) Show that x is odd and y is even. (Hint: show that 0,1 and 4 are the only squares mod 8)
2) If δ is a common divisor of $y + i$ and $y - i$ then δ is a unit. (Hint: show that δ divides $2i$ and that $N(y+i)$ is odd)
3) Show that all units in $\mathbb{Z}[i]$ are cubes (Hint: what are the units in $\mathbb{Z}[i]$?)
4) Show that that for any irreducible divisor p of $y + i$, p^3 divides $y + i$. Conclude that there exist a and b in $\mathbb{Z}$ such that $y + i = (a + bi)^3$.
5) Compute the imaginary part of $(a + bi)^3$ and conclude that there is no integer solution to $x^3 = y^2 + 1$ besides the trivial one: ($x = 1, y = 0$).

Homework for week 11/28-12/02:
Due Monday 12/05

11/28 Chapter 11.1: ex 4-6-9-22

11/30 Chapter 11.2: ex 4-8-18

12/02 Chapter 11.3: ex 4-6

Bring back Quiz 5 on Friday 12/02

Final on Monday 12/12, 12:45-2:45pm
Covers: Sylow subgroups, Integral domains (Euclidian domain, Principal Ideal domains, Unique factorization domain, Quadratic integer domains), Field extensions (vector spaces, simple extensions, algebraic extensions, splitting fields)

List of exercises to prepare for the final (some old, some new):
Fields extensions:
Chap 11.4: ex 1-2-3, Chap 11.3: ex 3-5-7-9, Chap 11.2: ex 5-13-23
Integral domains:
Chap 10.3: ex 2-7-9-19, Chap 10.2: ex 9-10-14-19, Chap 10.1: ex 13-21-27
Sylow subgroups:
Chap 9.5: ex 7, Chap 9.4: ex 1-21, Chap 9.3 ex 6-7-21