

Classical Algebra

Math 326

Assignments

Fall Semester, 2007

Assignments are listed by the **date due**. A PDF version of this page is available for printing.

These are exercises designed to prepare you for the quizzes and the written assignments. Those which are to be submitted as written assignments are so labeled. While you may find it helpful to discuss the exercises with others, no collaboration is permitted on the written assignments.

Tue., Dec. 11:

Final Examination: 3:30 – 5:30

Mon., Dec. 10:

Office hours: 2:15 – 4:15

Fri., Dec. 7:

Written Assignment No. 5 (also available as PDF) is due.
Bring your questions.

Wed., Dec. 5:

Quiz Read: § 28C

Exercises:

418: 8, 11, 12

421: 5 – 7, 10, 11

425: 4 – 6, 8 – 12

Mon., Dec. 3:

Read: §§ 28A, 28B

Exercises:

351: 12, 13, 15

356: 7, 10

416: 2, 3, 5, 6

421: 1, 2, 4

Find a primitive root mod 343.

Fri., Nov. 30:

Read: §§ 24A, 24B

Exercises:

350: 7, 9 – 11

352: 7

356: 2 – 6

361: 5

Wed., Nov. 28:

Read: §§ 23A, 23B

Exercises:

1. **252:** 14, 15

2. **307:** 12 – 14

3. **309:** 3, 4

4. **350:** 2 – 4

5. **352:** 2

6. The field \mathbf{F}_9 of 9 elements is defined as a ring of congruence classes:

$$\mathbf{F}_9 = \mathbf{F}_3[t]/(t^2 + 1)\mathbf{F}_3[t] \quad .$$

(a) Find the order of t in \mathbf{F}_9 .

(b) Find a primitive element of \mathbf{F}_9 .

(c) How many primitive elements does \mathbf{F}_9 have?

Mon., Nov. 26:

Quiz

Class will be held, but there is no specific assignment for this day.

Wed–Fri., Nov. 21–23:

University Recess

Mon., Nov. 19:

Quiz

Read: § 20B

Exercises:

262: 9 – 11

304: 4 – 7

307: 8 – 11

309: 1, 2

Fri., Nov. 16:

Quiz

Read: § 20A

Exercises:

251: 12, 13, 16

258: 7

262: 5 – 8

303: 1 – 3

Wed., Nov. 14:

Read: §§ 16C, 16D

Exercises:

249: 14, 15

251: 10, 11

257: 4 – 6

262: 1 – 4

Mon., Nov. 12:

Quiz

Read: §§ 16A, 16B

Exercises:

249: 10, 11

251: 8, 9

257: 1 – 3

Fri., Nov. 9:

Written Assignment No. 4 (also available as PDF) is due.

Wed., Nov. 7:

Read: § 15D

Exercises:

1. **248:** 7 – 9, 12

2. **251:** 4, 5, 7
3. Why should 3 and 31 have the same order mod 7?
4. Show that 3 is primitive in $\mathbf{Z}/49\mathbf{Z}$.
5. Show that 31 is not primitive in $\mathbf{Z}/49\mathbf{Z}$.
6. Find the smallest prime $p > 2$ for which the smallest positive integer c that is primitive in $\mathbf{Z}/p\mathbf{Z}$ is not also primitive in $\mathbf{Z}/p^2\mathbf{Z}$.

Mon., Nov. 5:

Read: § 15C

Exercises:

1. **243:** 10, 11
2. **246:** 1, 2, 4, 6
3. Show that 2 is a primitive element in $\mathbf{Z}/m\mathbf{Z}$ for $m = 11$ and 19 but not for $m = 11 * 19 = 209$.
4. Find all roots of the polynomial $x^3 - 1$ in $(\mathbf{Z}/m\mathbf{Z})[t]$ for $m = 11, 19,$ and 209 .
5. What is the largest order of any element in $\mathbf{Z}/209\mathbf{Z}$?

Fri., Nov. 2:

Read: § 15B

Exercises:

1. **243:** 4, 5, 7, 8
2. **245:** 1
3. Find primitive elements for $\mathbf{Z}/17\mathbf{Z}$, $\mathbf{Z}/23\mathbf{Z}$, and $\mathbf{Z}/34\mathbf{Z}$.
4. Show that there is no primitive element in $\mathbf{Z}/32\mathbf{Z}$.

Wed., Oct. 31:

Read: § 15A

Exercises:

- 163:** 22
- 200:** 13, 15
- 205:** 6, 8
- 236:** 5
- 238:** 7 - 9
- 241:** 1
- 243:** 6

Mon., Oct. 29:

Read: Ch. 14

Exercises:

- 163:** 18, 21
- 200:** 11, 12
- 205:** 5, 7
- 233:** 1, 2
- 234:** 3
- 236:** 4

Fri., Oct. 26:

Read: § 12B

Exercises:

- 163:** 15 - 17
- 169:** 5, 6
- 196:** 5 - 7, 10
- 203:** 1, 3

Wed., Oct. 24:

Midterm Test in class

Mon., Oct. 22:

Review Session: bring questions

Fri., Oct. 19:

Written Assignment No. 3 (also available as PDF) is due.

Wed., Oct. 17:

Read: § 12A

Exercises:

141: 18

163: 10, 11, 13, 14

169: 3, 4

196: 1 – 3

Mon., Oct. 15:

Read: § 10B

Exercises:

141: 17, 19

145: 16, 17

147: 6

153: 3, 8

158: 3, 4, 7

166: 1, 2

Fri., Oct. 12:

Quiz

Read: §§ 9F, 10A

Exercises:

138: 14 – 18

141: 13, 15, 16

145: 12, 13, 15

147: 3, 5

153: 1, 2

158: 1, 2

Wed., Oct. 10:

Read: §§ 9D, 9E

Exercises:

122: 16, 17

137: 10 – 13

141: 6, 9 – 11, 14

144: 8, 11(i-iii)

147: 2, 4

Mon., Oct. 8:

Read: §§ 9B, 9C

Exercises:

122: 14, 15

127: 8, 9

133: 7, 10

137: 3, 5, 7 – 9

141: 3 – 5, 7

142: 1

Fri., Oct. 5:

Written Assignment No. 2 (also available as PDF) is due.
(The written assignments must be submitted on paper – no email.)

Wed., Oct. 3:

Quiz

Read: §§ 8C, 9A

Exercises:

- 90:** 12, 13
- 122:** 9, 12, 13
- 125:** 5 – 7
- 133:** 5, 6, 9
- 136:** 1, 2, 4

Mon., Oct. 1:

Read: §§ 8A, 8B

Exercises:

- 74:** 9
- 86:** 8, 9
- 89:** 4 – 7, 9 – 11
- 121:** 1, 3, 5, 8
- 125:** 2 – 4

Fri., Sep. 28:

Read: §§ 6D, 6E

Exercises:

- 73:** 6 – 8
- 84:** 2 – 5
- 86:** 1 – 3, 5, 7
- 89:** 1 – 3

Wed., Sep. 26:

Quiz

Read: §§ 6A, 6B, 6C

Exercises:

- 54:** 32 – 34
- 62:** 1, 2
- 67:** 9
- 70:** 6
- 72:** 2, 4, 5
- 73:** 2 – 5
- 80:** 3
- 84:** 1

Problem solution (also available as PDF) requested by not presented during Monday's class.

Mon., Sep. 24:

Read: §§ 5D, 5E

Exercises:

- 52:** 15, 16
- 54:** 28, 30, 31
- 59:** 5
- 65:** 7, 8
- 67:** 7, 8
- 70:** 4, 5
- 72:** 1, 3
- 73:** 1

Fri., Sep. 21:

Written Assignment No. 1 (also available as PDF) is due.

Wed., Sep. 19:

QUIZ

Read: §§ 5B, 5C

Exercises:

35: 20

51: 10, 11, 13

53: 19 – 21, 25

65: 5, 6

67: 2, 3, 5, 6

70: 1, 3

Mon., Sep. 17:

Read: §§ 4C, 5A

Exercises:

35: 11, 14, 18

50: 3, 4

51: 3, 4, 7 – 9

64: 1, 3, 4

Fri., Sep. 14:

University in Recess: no class

Wed., Sep. 12:

QUIZ

Read: §§ 4A, 4B

Exercises:

35: 8, 9, 13, 20

45: 3

49: 1, 2

51: 1, 2

Mon., Sep. 10:

Read: § 3E

Exercises:

33: 4(iv, v)

35: 6, 7(i, ii)

45: 1

Find the continued fraction expansion of:

1. $40487/257$

2. $(1 + \sqrt{5})/2$

3. $\sqrt{17}$

Fri., Sep. 7:

Quiz

Read: the course notes on *Continued Fractions*¹ (also available as PDF²)

Exercises:

29: 4, 6(ii, iv)

33: 2, 3, 4(iii)

35: 5

Evaluate the continued fraction represented by the sequence $[3, 2, 7, 2]$.

Find the continued fraction expansions of

¹URI: ../cfrac/confrac.xhtml

²URI: ../cfrac/confrac.pdf

1. 61/67.
2. 44/37.

Wed., Sep. 5:

Read: §§ 3B, 3C

Exercises:

23: 5

24: 5

27: 6, 9, 10, 11

29: 2, 5, 6(iii, iv)

33: 4(i)

And this: Recall that 20314_5 was found to be 1334_{10} . Cipher in base 5 to convert this number from base 5 to base 7, and then check that result by converting it from base 7 to base 10.

Announcement: Undergraduates in the Department are invited to join the **math club**. There is a *Yahoo* online group called “albanymath” that students can join for sharing ideas and posting and receiving announcements of events and resources.

Mon., Sep. 3:

Labor Day Recess: no class

Fri., Aug. 31:

Read: §§ 2D – 2F, 3A, 3B

Exercises:

6: 4

11: 6, 8

18: 2

19: 1

23: 1 – 4

24: 1 – 3

27: 5

Wed., Aug. 29:

Read: §§ 1, 2A – 2C

Exercises:

6: 2

11: 2, 4, 5, 10, 14

15: 2, 4

If you wish to enter the writing intensive division of the course (Math 326Z), please be sure to submit the required essay³ (also available as PDF⁴) at this class (or earlier).

Mon., Aug. 27:

First meeting: no assignment.

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³URI: <http://math.albany.edu/math/pers/hammond/course/mat326f2007/ab326wi.xhtml>

⁴URI: <http://math.albany.edu/math/pers/hammond/course/mat326f2007/ab326wi.pdf>