

Classical Algebra (Math 326)

Assignments

Fall Semester, 2003

Assignments are listed by the **date due**.

PDF and DVI (requires *TeX*¹ software) versions of this page are available for printing.

Most of these assignments are simply 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.

Final Exam: Friday, December 12, at 10:30

Exam Period Office Hours

Wed., Dec. 10:

Bring review questions.
Expect a short quiz.

Mon., Dec. 8:

Written Assignment No. 5 (also available as PDF or DVI) is due.
Bring review questions.

Fri., Dec. 5:

Read: §§ 28B, 28C

Exercises:

351: 12, 13, 15
356: 6, 7, 10
418: 8, 11, 12
421: 1, 2, 5 – 7
425: 4 – 6, 9 – 12

Wed., Dec. 3:

Read: §§ 24A, 28A

Exercises:

305: 6, 7
307: 9, 10, 14
350: 9 – 11
356: 2 – 5
416: 2, 3, 5, 6

Mon., Dec. 1:

Read: § 23A

Exercises:

¹URI: <http://www.tug.org/>

1. **252:** 14, 15
2. **263:** 11
3. **304:** 4, 5
4. **307:** 8 – 10, 12
5. **309:** 1 – 3
6. **350:** 2 – 4
7. 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?

Wed, Fri., Nov. 26, 28:
University Recess

Mon., Nov. 24:
Read: §§ 20A, 20B
Exercises:

- 249:** 15
- 251:** 10 – 13
- 257:** 4 – 6
- 262:** 7, 9, 10
- 303:** 1 – 3

Fri., Nov. 21:
 Written Assignment No. 4 (also available as PDF or DVI) is due.

Wed., Nov. 19:
Read: §§ 16A, 16B, 16C, 16D
Exercises:

- 249:** 10, 11
- 251:** 8, 9
- 257:** 1, 3
- 262:** 1 – 3, 6

Mon., Nov. 17:
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 $\mathbf{Z}/p^2\mathbf{Z}$.

Fri., Nov. 14:

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 $\mathbf{Z}/209\mathbf{Z}$?

Wed., Nov. 12:

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 $\mathbf{Z}/32\mathbf{Z}$.

Mon., Nov. 10:

Read: § 15A

Exercises:

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

Fri., Nov. 7:

Read: Ch. 14

Exercises:

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

Wed., Nov. 5:

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

Mon., Nov. 3:

Read: § 12B

Exercises:

- 163:** 15 – 17
- 169:** 5, 6
- 196:** 5 – 7, 10

203: 1, 3

Fri., Oct. 31:

Read: § 12A

Exercises:

141: 18

163: 10, 11, 13, 14

169: 3, 4

196: 1 – 3

Wed., Oct. 29:

Read: § 10B

Exercises:

141: 17, 19

145: 16, 17

147: 6

153: 3, 8

158: 3, 4, 7

166: 1, 2

Mon., Oct. 27:

Read: §§ 9F, 10A

Exercises:

138: 14 – 18

141: 13, 15, 16

145: 12, 13, 15

147: 3, 5

153: 1, 2

158: 1, 2

Fri., Oct. 24:

Read: §§ 9D, 9E

Exercises:

122: 16, 17

137: 10 – 13

141: 6, 9 – 11, 14

144: 8, 11(i-iii)

147: 2, 4

Wed., Oct. 22:

Read: §§ 9B, 9C

Exercises:

122: 14, 15

127: 8, 9

133: 7, 10

137: 3, 5, 7 – 9

141: 3 – 5, 7

142: 1

Mon., Oct. 20:

Read: §§ 8C, 9A

Exercises:

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

Fri., Oct. 17:
Midterm Test

Wed., Oct. 15:
Review Session: Bring questions.

Mon., Oct. 13:
Read: §§ 8A, 8B
Exercises:

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

Fri., Oct. 10:
Written Assignment No. 2 (also available as PDF or DVI) is due.

Wed., Oct. 8:
Read: §§ 6D, 6E
Exercises:

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

Mon., Oct. 6:
University in recess.

Fri., Oct. 3:
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

Wed., Oct. 1:
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

Mon., Sep. 29:

No class. University recess ends at 12:20 on this date.

Fri., Sep. 26:

Note: This class **will meet**. (A University recess begins at 12:10 on this date.)

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

Wed., Sep. 24:

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

Mon., Sep. 22:

Read: §§ 4C, 5A

Exercises:

35: 11, 14, 18
50: 3, 4
51: 3, 4, 7 – 9
64: 1, 3, 4

Fri., Sep. 19:

Read: §§ 4A, 4B

Exercises:

35: 8, 9, 13, 20
45: 3
49: 1, 2
51: 1, 2

Wed., Sep. 17:

Read: § 3 E

Exercises:

- 33:** 4(iv, v)
- 35:** 6, 7(i, ii)
- Find the continued fraction expansion of:
 - 40487/257
 - $(1 + \sqrt{5})/2$
 - $\sqrt{17}$
- 45:** 1

Mon., Sep. 15:

Read: the course notes on *Continued Fractions*² (also available as PDF³ or DVI⁴)

Exercises:

1. **29:** 4, 6(ii, iv)
2. **33:** 2, 3, 4(iii)
3. **35:** 5
4. Find the continued fraction expansions of
 - (a) $61/67$.
 - (b) $44/37$.
5. Evaluate the continued fraction represented by the sequence $[3, 2, 7, 2]$.

Fri., Sep. 12:

Read: § 3C

Exercises:

- 23:** 5
24: 5
27: 9, 11
29: 6(iii, v)
33: 4(i)

Wed., Sep. 10:

Read: §§ 3A, 3B

Exercises:

- 23:** 3, 4
24: 1, 3
27: 5, 6, 10
29: 2, 5

Mon., Sep. 8:

Read: §§ 2D, 2E, 2F

Exercises:

- 6:** 4
11: 6, 8
18: 2
19: 1
23: 1, 2
24: 2

Fri., Sep. 5:

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 essay (also available as PDF or DVI) at this class (or earlier).

²URI: ../../cfrac/confrac.html

³URI: ../../cfrac/confrac.pdf

⁴URI: ../../cfrac/confrac.dvi

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