## Instructor


| *Name* | *E-mail* | *Office* |
|---|---|---|
| Aaron Fenyes | afenyes@math.toronto.edu | PG 205 B |


## Course description

An introduction to one-dimensional dynamics. The central focus of the course will be the dynamics of quadratic maps, leading up to a discussion of Julia sets and the Mandelbrot set. We'll encounter symbolic dynamics, conjugacy of dynamical systems, and bifurcations on our way to this goal. Other topics will include the dynamics of linear maps and the Hénon map.

**Textbook** Most of the material I teach will be drawn from *A First Course in Chaotic Dynamical Systems*, by Robert L. Devaney. Having access to this book is strongly recommended, though not absolutely required.

You may use *Introduction to Chaotic Dynamical Systems (2nd edition)*, also by Robert L. Devaney, as an alternate text. However, I expect *A First Course* to be a more useful reference for most students.

**Web site** Most of the documents and information you need will be posted on the course web site,

> http://www.math.toronto.edu/afenyes/teaching/mat335-winter2019/.

The web site will be updated regularly with homework assignments, lecture notes, exam information, and other materials.

Announcements will be sent by e-mail. They can will also appear on the Announcements page of the course Quercus site, which you can reach from

> https://q.utoronto.ca.

Grades will appear on the Grades page of the Quercus site.

## Office hours and discussion board

I encourage you to work together with your classmates and I throughout the term. Don't hesitate to reach out if you're stuck on a homework problem or confused about something you're trying to learn.

**Office hours** I'll typically schedule three hours of office hours each week. Their times may change over the course of the semester. They'll be posted at

> http://www.math.toronto.edu/afenyes/

and announced over e-mail. They'll be held in my office, PG 205 B, unless I specify otherwise.

**Discussion board** You can work with your classmates online through the Piazza discussion board. Once you sign up at

https://piazza.com/utoronto.ca/winter2019/mat335/,

you'll be able to access the site at

https://piazza.com/utoronto.ca/winter2019/mat335/home.

If you have any technical problems, or you want to send feedback, you can e-mail the Piazza developers at team@piazza.com.

## Homework

There will be five homework assignments. They'll be posted on the course web site. They're due at 11 a.m. on the dates shown in the schedule below—roughly every two weeks.

I encourage you to work together with your classmates and I on the homework assignments. **However, you must write your solutions in your own words.** You must hand-write or type your solutions yourself if possible. (If this is not possible, please contact Accessibility Services as soon as possible to arrange an accommodation.)

**Submission** Homework assignments should be submitted electronically through Crowdmark whenever possible. (If there are circumstances that will make electronic submission unreasonably difficult for you, please tell me as soon as possible.)

**Redoing problems** Once you get your homework back, you'll typically have the chance to improve your score by redoing some or all of the problems. The number of problems you can redo may vary depending on the graders' availability (it may sometimes be zero). I'll announce the number of redos when the homework is returned.

The due date for redone solutions will be announced around the time the homework is returned.[1] If your redone solution to a problem scores higher than the original, your final score for that problem will be the average of the redone and original scores. Redoing a problem will never lower your final score.

**Late work** Homework is due at 11 a.m. on each due date.

Late homework will typically not be accepted (I may accept homework that's only a few minutes late, at my discretion). When I provide redos for an assignment, however, you can use them to redo problems you didn't turn in when the assignment was originally due.

## Term tests

[1] Updated Jan. 29, by class vote. Original version: "Redone solutions are due at the same time as the next homework assignment (I'll announce the redo date for the last assignment later)."

There will be two term tests. They'll be given in the evening, on the dates listed in the schedule below.

You'll have two hours to finish each term test. I'll try to design the tests so that most students won't need the full two hours.

**Missing a term test.** If a religious, academic, or similar obligation will prevent you from taking a term test at the scheduled time, please let me know as soon as possible, so I can schedule an alternate sitting if appropriate.

If you miss a term test for medical reasons, you must submit an official University of Toronto "Verification of Student Illness or Injury" form. The missed test will not count toward your final grade. The weights of the other tests will be increased proportionally to compensate.

If you miss a test for an unforseen non-medical reason, please ask both me and the Office of the Ombudsperson about your options.

## Final Exam

We'll have a final exam during the final exam period. You'll have three hours to finish it.

## Marking Scheme

Your grade consists of the following parts.

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|---|---|
| Homework | 25% |
| Term Test 1 | 20% |
| Term Test 2 | 20% |
| Final exam | 35% |

If student performance suggests that an assignment was too hard or too easy, I may adjust the scores for that assignment. I'll announce any adjustments when I publish scores on Quercus.

## Code of behaviour, including plagiarism policy

I expect you to follow the University of Toronto's Code of Behaviour on Academic Matters, which can be found at

http://www.governingcouncil.utoronto.ca/policies/behaveac.htm

Please make sure you're familiar with its requirements.

## Schedule

| Week | Dates | | Homework | Tests |
|---|---|---|---|---|
| 1 | Jan. 8, | 10 | | |
| 2 | Jan. 15, | 17 | Homework 1 due Jan. 17, 11 a.m. | |
| 3 | Jan. 22, | 24 | | |
| 4 | Jan. 29, | 31 | Homework 2 due Jan. 31, 11 a.m. | |
| 5 | Feb. 5, | 7 | | |
| 6 | Feb. 12, | 14 | | Term Test 1 held Feb. 12, 7–9 p.m. |
| No class | Feb. 19, | 21 | | |
| 7 | Feb. 26, | 28 | Homework 3 due[2] Mar. 4, 11 a.m. | |
| 8 | Mar. 5, | 7 | | |
| 9 | Mar. 12, | 14 | | Term Test 2 held Mar. 12, 7–9 p.m. |
| 10 | Mar. 19, | 21 | Homework 4 due Mar. 21, 11 a.m. | |
| 11 | Mar. 26, | 28 | | |
| 12 | Apr. 2, | 4 | Homework 5 due Apr. 4, 11 a.m. | |

[2]Updated Feb. 27, by class vote. Original version: "Feb. 28."