Fall 2019 TS Mathematics Syllabus

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Office Hours: T-F, 2:30-3:30

TA: Claire Gao
Email: TBA
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Course Schedule: M-F 12:30-1:20pm

Course Website: Keep track of the class Canvas page.

Required Text: *Precalculus: A First Course in Problem Solving*, by Collingwood, Prince, and Conroy. This text was written by professors at the University of Washington, specifically for UW's own Precalculus class; it is available for about $20 at Professional Copy and Print on the Ave. There is also an online PDF available for free at https://sites.math.washington.edu/~colling/HSMath120/TB201112.pdf, which students should feel welcome to use when working at home, but students will be expected to bring a hard copy to class.

1 Fall Class Description

During Fall Quarter, our aim will be to achieve a deep and adaptable understanding of functions, while developing essential skills of mathematical inquiry and presentation. We will cover the basics of the typesetting language LaTeX, with an emphasis on developing the skills needed to achieve further mastery independently; the first seven chapters of the Collingwood textbook, which range from review of Algebra II principles to the underlying concepts of functions; the basics of mathematical writing; and, through inquiry-based projects throughout the quarter, the fundamentals of asking good mathematical questions.

2 Student Responsibilities

2.1 Canvas and Email

Students should check the Canvas and their email at least once a day, and respond to email promptly, in order to stay up-to-date on assignments and related responsibilities.

2.2 Course Grade

The overall course grade will follow the standard Transition School system, meaning a grade in the range of 1 through 4, possibly with + or − modifiers. Good interpretations of the grades are the following:

- **4:** The student's work significantly exceeds expectations.
- **3:** The student's work meets expectations. It is important to note that a 3 means that the student is *on track to succeed.*

- **2:** The student's work needs improvement. This suggests that the student might need additional help, and should consider all resources they have at their disposal (including the instructor and TA).
- **1:** The student's work needs extensive improvement. A 1 is a serious warning sign, but not an irreparable one; students receiving a 1 should seek out immediate supports.

2.3 General Assignment Standards

For all assignments in this class, the correctness of the math is of course important - but clarity and organization are important as well. All assignments should therefore be **typed using the free typesetting software LaTeX;** they should also be **clearly written**, with all details **clearly explained** and problems **in order.** Diagrams can be hand-drawn - and are absolutely encouraged - but should be drawn as clearly as possible. Alternatively, LaTeX does have a package called `tikz`, which allows the use of computer-generated diagrams.

2.4 Collingwood Homework: 25%

Daily homework assignments will consist of **one to three problems from the Collingwood textbook.** For these assignments, students should try to start the problems on their own, but are *heavily* encouraged to collaborate with or seek help from any of their resources – including each other, the TA, or myself. See the "Academic Integrity" section at the end of this syllabus for some details on how much collaboration is allowed.

As a general rule, homework assignments will be graded on a ten-point scale:

- **Ten points** means perfect or essentially perfect, in terms of correctness, clarity, and presentation.
- **Nine points** means nearly perfect, with a few minor errors.
- **Five points** means there were substantial errors, with otherwise good work.
- **One point** means that some work in the proper direction was present, but nothing more.
- **Zero points** means nothing in the proper direction was present; students should expect to receive zero points only for assignments that were not submitted.

Late or incomplete daily homework will not receive credit, but will receive feedback - so if, for whatever reason, a student can't get an assignment done on time, turning it in anyway will help them prepare for the tests.

2.5 Projects: 30%

During the first half of the quarter, we will engage in *question-building* exercises. These will be largely graded based on completion (i.e., full credit will be awarded to any work that is turned in) but students should strive to make use of the feedback received on those assignments. The skills built in that process will be used in the second half of the quarter, when the students will write two *projects*. These projects are essentially student-driven inquiry-based papers; while I and the TA will provide a rich scaffolding for the development of ideas, the ultimate choice of what topics to pursue and how to pursue them will be down to the student.

Projects will be graded based on a five-category rubric which will be introduced in detail when the first project is assigned. Each category will be graded on a scale from zero to three, with the overall grade dependent on the sum of the scores in each category.

2.6 Tests: 40%

Tests are divided into three major categories: quizzes (3.75% of the course grade each, usually covering one or two chapters); a midterm (10% of the course grade, covering roughly the first half of the quarter's material); and a final exam (15% of the course grade, covering the whole quarter's material). Quizzes will be short (about 20 minutes each, leaving plenty of time for class); the midterm will occupy a full class period, and the final will be two hours.

2.7 Participation: 5%

Attendance is required, and participation in class – on worksheets, in discussions, and so on – is expected. Students who are active and engaged during most class periods will receive full credit in this category. Crucially, **correctness is not assessed in this category, only engagement.** See Section 4.4 (On Confidence and Being Wrong) for details.

3 Course Schedule

The following is a rough schedule of the quarter. It is subject to change without notice.

Week	Topic	Tests and Projects
Sept. 25 – 27	Introductions, LaTeX, and Ch. 1 (Units and Rates)	–
Sept. 30 – Oct. 4	LaTeX, Mathematical Writing, and Ch. 1 (Units and Rates)	Quiz 1 (Chapter 1)
Oct. 7 – 11	Ch. 2 (Coordinate Systems)	Question-Building 1
Oct. 14 – 18	Ch. 3 (Circles and Lines)	Quiz 2 (Chapters 2–3)
Oct. 21 – 25	Ch. 4 (Linear Modeling)	Question-Building 2
Oct. 28 – Nov. 1	Begin Ch. 5 (Functions)	Midterm Exam (Nov. 1, Chapters 1–4)
Nov. 4 – 8	Ch. 5-6 (Functions and Graphical Analysis)	–
Nov. 11 – 15	Ch. 6 (Graphical Analysis)	Quiz 3 (Chapters 5–6); Project 1 Draft
Nov. 18 – 22	Ch. 7 (Quadratics)	Project 1 Due
Nov. 25 – 29	Ch. 7 (Quadratics)	Quiz 4 (Chapter 7)
Dec. 2 – 6	Review and Elaboration	Project 2 Draft
Dec. 7 – 13	Finals Week	Final Exam (TBA); Project 2 Due

4 Pedagogy and Expectations

4.1 On Memorization

It is important to remember things, but this class is **not about memorization.** The key is to understand the ideas, not to remember formulas. For exams (the midterm and the final) students will be allowed to use a one-page note sheet, which can include any formulas or other details that they don't feel confident remembering; so, when studying, students should concentrate on remembering techniques and concepts.

4.2 On Simplification and Evaluation

Many students are accustomed to performing operations like simplification and evaluation of arithmetic expressions automatically. In this class, both of these should be done *only for a purpose*. For example, one might choose to simplify a complicated expression to make the answer clearer; or to make it easier to use in the next step of a problem. But one does not need to simplify just for the sake of simplification. Likewise, this class does not focus on calculator skills; any arithmetic expression which could be entered into a calculator for a correct answer is generally acceptable as a final answer.

4.3 On Exact Answers

In the sciences, answers are generally expected to be rounded to an appropriate number of decimal places; machinery called *significant figures* provides a means of determining how many decimal places that is. It's generally unreasonable to provide answers at higher precision than the data provided in the question – after all, if we don't know whether the track is 100 meters or 101 meters long, how can we possibly know the time a race-car takes to cover it to microsecond accuracy? In mathematics, however, it is generally assumed that the information provided is exact, unless otherwise stated. Accordingly, **answers should generally be in exact form, rather than rounded.** There are some exceptions, which we will discuss in class, but students should use this as a general rule of thumb.

4.4 On Confidence and Being Wrong

It's common for a student to measure themselves in a math class based on how often and how quickly they are able to answer questions correctly. A student who finds that their colleagues often beat them to the correct answer, or feels that they are wrong more often than their classmates, can come to feel badly about their own abilities. It is crucial to realize that **different students work at different speeds** and that **this difference in speed has nothing to do with capacity to succeed.**

Correctness is, of course, important – homework and tests will be graded largely based on correctness, for example. But **it is often more instructive to be wrong than to be right.** An incorrect answer can highlight interesting connections or missing pieces of understanding, and if offered in class can help both the student who gave the answer and any of their colleagues who might have similar gaps in their understanding.

To help support this point of view, please note that **the effect of in-class participation on a student's grades will not depend on whether their answers were correct**, and the only impact such participation will have on my assessment of a student will be in determining how best to help that student succeed.

4.5 On Respect

Throughout the course, students will be expected to respect one another as students of mathematics and as colleagues. What exactly that means will be a topic for us to discuss in the first weeks of the class, but the most important principle is this: **feeling insecure about one's mathematical ability is common**, and students should always aim to reduce that insecurity rather than reinforcing it. Apart from the obvious beneficial effects of building a positive and supportive community, **confidence in mathematics can help a student succeed**, so by supporting your classmates you can help them get the most out of this class.

5 Learning Objectives

By the end of this course, students should be able to…

- ☐ Recall the basic definitions or meanings of all of the following, and be able to restate all of those definitions or meanings in their own words:

- ☐ Units
- ☐ Coordinate systems (including both the origin and the axes)
- ☐ Circles
- ☐ Lines
- ☐ Functions
- ☐ Quadratics

☐ Convert from any unit to any other unit of the same type.

☐ Construct a coordinate system appropriate to a given problem, and determine which of several coordinate systems is most appropriate.

☐ Achieve facility with circles:

- ☐ Write an equation for a circle with a given center and radius.
- ☐ Determine the center and radius of a circle with a given equation.
- ☐ Find points of intersection between circles and other curves.

☐ Achieve facility with lines:

- ☐ Write an equation for a line with a given slope and passing through a given point.
- ☐ Construct a linear function to model real-world phenomena.

☐ Achieve facility with quadratics:

- ☐ Write an equation for a parabola with a given vertex and direction.
- ☐ Determine the vertex and direction of a parabola with a given equation.
- ☐ Construct a quadratic function to model real-world phenomena.

☐ Determine whether a linear function, a quadratic function, or neither would be an appropriate choice for modeling a given phenomenon.

☐ Achieve facility with functions in general:

- ☐ Determine whether a relationship is a function based on its description in English.
- ☐ Determine whether a relationship is a function based on its graph.
- ☐ Determine the intervals over which a function is increasing, decreasing, or constant, based on its graph.
- ☐ Write a formula for a multipart (piecewise) function matching a graphical or English description.
- ☐ Find points of intersection between multipart functions and other curves.

☐ Write detailed and clear explanations of solutions to problems, presented using the typesetting software LaTeX.

☐ Offer constructive critique of explanations written by other students.

☐ Evaluate mathematical questions for their quality and depth.

☐ Formulate novel mathematical questions of their own which draw important connections between ideas.

☐ Pursue challenging problems, alone or in a group, that take time on the scale of hours or days.

6 Policies

6.1 Academic Integrity

Collaboration is one of the central focuses of this class, so students are not only encouraged but often *required* to work together. At the same time, it is important that a student's work be their own. In some cases, the line between these is clear-cut - for example, studying for an exam together is perfectly acceptable; copying off of a classmate during the exam is obviously not. But in other cases, it's hard to tell - when does working on a homework assignment stop being **collaborating** and start being **copying**?

The first general rule is that working together should always be about **improving understanding, not getting an answer.** But that's hard to measure, so in this class we'll also go by something called the **Gilligan's Island Rule:** collaborate as much as you want, but then take half an hour to watch Gilligan's Island (or work on a history paper, for example) before you write up your answer for yourself. If you still retain it, it's your own work.

6.2 Late Work and Make-up Tests

Late work and make-up tests or exams will in general **not be accepted for credit** without at least 24 hours notice. If a student knows that they won't be able to attend a test or turn in an assignment on time, they should get in touch with me as soon as possible and we'll work the situation out together.

In the case of homework, missing a few assignments this way isn't a big deal, as there are a large number of assignments and they aren't worth a large portion of the grade. Missing tests is a bigger problem, so it's very important that students let me know as soon as possible if they're going to miss a test.

While late work may not be accepted for credit, it **will receive feedback** - so it's a good idea to turn in homework, even if it's late, so that you can learn from the response.

6.3 Students with Disabilities

Students with disabilities are guaranteed the right to request and receive reasonable accommodations by Washington state law. We are often able to provide accommodations for temporary health conditions or for permanent disabilities, including but not limited to those with mental health, attention-related learning, vision, hearing, physical, or health impacts. If you have already contacted Disability Resources for Students (DRS), please speak to me as soon as possible to discuss how we can put your approved accommodations into practice.

If you have not yet established services through DRS, but believe you might be eligible for accommodations on the basis of a health condition or disability, I strongly recommend contacting DRS using the contact information provided below.

Disability Resources for Students

Phone: 206-543-8924

Email: uwdrs@uw.edu or disability@uw.edu

6.4 Religious Accommodations

Washington state law requires that UW develop a policy for accommodation of student absences or significant hardship due to reasons of faith or conscience, or for organized religious activities. The UW's policy is available at Religious Accommodations Policy (https://registrar.washington.edu/staffandfacultyaccommodations-policy/).

Students interested in requesting religious accommodations must contact the Transition School Principal in writing with their request within the first two weeks of the course. The written request should include the following information:

- Student's full name
- Course(s) that will be affected
- Requested accommodation
- Date(s) accommodation needed

6.5 Living Document

It should be noted that this syllabus is a living document, and may be changed in response to the needs of the class; students will be made aware of any such changes.