Math 111 Final Review

The Math 111 final will be 9 am–noon, Monday, December 12. It will be sent by email just before 9 am and is due on Gradescope at 12:15 pm. It will be closed book/notes/calculator/internet/etc. I have listed what you need to know below. A copy of the essential derivatives handout will be provided for your use during the exam.

Note: For those problems that involve calculations, credit will be awarded only if you show your work.

Office hours. My office hours before the exam: 1:15–3 pm Thursday, December 8 and 6:30–8 pm Sunday, December 11 via Zoom (see our Moodle page for the link.)

Limits.

» Know the definition of the limit of a function (Friday, Week 1). You should practice the definition by writing it from memory on a sheet of paper and comparing with the actual definition until you get it perfectly. Changing almost any part of the definition will break it!

» Use the definition of the limit to calculate the limit of a simple function (Friday, Week 1, starting on p. 3; Wednesday, Week 2).

Continuity.

» What does it mean to say a function is continuous (Wednesday, Week 3)?

Derivatives.

» Know the definition of the derivative (Monday, Week 4).

» Be able to use the definition of the derivative to compute derivatives of uncomplicated functions (Monday and Wednesday, Week 4).

» Know the sum, product, and quotient rules for derivatives (Wednesday and Friday, Week 4). Know how to prove the sum rule for derivatives (Friday, Week 4).

» Be able to use the above rules and the chain rule to calculate derivatives (Monday, Week 5; also see the slides for Wednesday and Friday, Week 5).

» Be able to compute the equation of a tangent line to a function at a given point (Wednesday, Week 4).

» Use the derivative to tell where a function is concave up or concave down (Week 7, Friday).

Optimization.

» Know the precise statement of the extreme value theorem (Week 6, Wednesday, Theorem 2) as given in the lecture notes.

» Be able to find the minimum and maximum of a function on a closed interval (Week 6, Friday, and Week 7, Monday).

Related rates.

» See Week 5, Friday and Week 6, Monday.

Integration.

» Know the definition of the integral. We worked on the definition for one solid week: from Week 8, Friday to Week 9, Friday. The actual definition is thoroughly discussed here: Week 9, Monday. Here is a summary handout: definition of the integral (which also includes the definition of a Riemann sum, which will not appear on the final).

» Know the precise statements of both versions of the fundamental theorem of calculus (FTC). Version I: Week 10, Monday and Week 12, Wednesday. Version II: Week 11, Monday.

⋆ **You will be asked to prove Version I of the fundamental theorem of calculus:** Week 12, Wednesday. Review the lectures from Week 12 carefully.

» Given a specific function and partition of an interval, be able to calculate the lower and upper sums for the function (approximating the integral) (Week 9, Wednesday).

» Compute antiderivatives using u-substitutions and integration by parts.

Differential equations.

» Solve a separable differential equation, using initial conditions to give a specific solution. To study for this, please read the lectures on population models, again. (Week 13, Monday, end of lecture; Week 13, Wednesday; Week 13, Friday.) Problem 1 on the last homework set is also a separable differential equation. The solution to that problem will be posted at our Moodle by the end of the week.

Practice with calculations.

To review problems that involve calculations, please look at your homework. Typeset solutions are available at the bottom of our Moodle page.