

# Intro to Calculus: Derivatives and Integrals

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Textbook: [\*Contemporary Calculus\*](#), by Dale Hoffman, licensed under the Creative Commons Attribution—Share Alike 3.0 United States License.

## Course Outline

Weeks 1–3: Chapter 0 – Welcome to Calculus

Week 4–7: Chapter 1 – Limits and Continuity

Weeks 7–15: Chapter 2 – The Derivative

Weeks 15–19: Chapter 3 – Derivatives and Graphs

Weeks 20–27: Chapter 4 – The Integral

Weeks 27–33: Chapter 5 – Applications of Definite Integrals

Weeks 34–36: Chapter 6 – Differential Equations

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Welcome to your first class in Calculus, and not the dental kind, either. Dental calculus comes from the root word for calcify. Mathematical calculus comes from a root that means calculate. That's how we get a single word meaning two vastly different things. It does, however, give us a pun we can sink our teeth into.

## Course Introduction

Traditionally, Calculus is taught in colleges as three one-semester courses. Because one year of high school is equivalent to one semester of college credit, High School Calculus is taught as a full-year course. It covers the first semester of college Calculus.

Our textbook will be the first seven chapters of *Contemporary Calculus*, by Dale Hoffman, which you may download in two parts from the lessons page at [SchoolhouseTeachers.com](http://SchoolhouseTeachers.com). This guide will help you pace yourself through the book, but the lessons, problems, and quizzes will come directly from the text.

The author of the textbook does a good job of painting word pictures to describe the math. You must read each paragraph like you would a story. Do not expect to skip the readings or examples and still understand the problem sets.

Instead, try to visualize the picture the author is creating with his words. For example, in the first lesson, he asks you to imagine drawing a graph on a wall and driving nails into the wall at points on the graph. Did you form a mental picture? That kind of in-depth reading will be required as you proceed through the course.

Another word to the wise: Don't try to read at midnight and expect to remember what you read the next day, either. I know, because I've tried it. It didn't work. Study math when your brain is fresh, probably in the morning.

The course is designed with practice problems to work out as you read each lesson. Don't forget, however, to also work through each example as it is presented in the textbook, along with the solution. This will be critical to your understanding of the course.

To be very clear, every section except section 0.1 has problems in the reading labeled "Practice Problems." You should work those out before you continue reading. They have answers after the problem set at the end of every section. The problems labeled "Example Problems" are worked out in the text, but you should also try to work them out in your notes as you follow along.

There are answer keys provided. Odd problems have their answers in the back of the book. Practice problems included in the textbook have their answers in each section, after the problem set. Selected even problems will be suggested in this lessons guide for extra practice. Those will be found in a separate answer key. You may attempt the other even problems on your own, but no answer key will be available for them.

It should go without saying, but do not forget this step. After you check your work, *go back and rework the problems you got wrong*. Studies have shown that once you make a mistake, you have to go back and do it correctly several times to erase the mistake from your memory patterns. If you never go back to correct your work, you will be more likely to remember the mistake instead of the correction.

Pro tip: the question directly before or after the one you missed will likely be a similar problem. Once you know how to solve the one you missed, try to do the similar problem. Then check your work on a graphing calculator.

About those calculators: Many colleges will allow graphing calculators to be used in class, but not the kind that manipulates the symbols for you (for example, translating an equation to its simplest form). (Source: <https://academics.math.arizona.edu/portal/?pg=kb.page&id=206>) They want students to be able to perform those mental steps by themselves.

The ACT assessment also does not allow these kinds of calculators (called CAS, for computer algebra system). However, the SAT might and some AP exams might allow them, according to Wikipedia: [https://en.wikipedia.org/wiki/Computer\\_algebra\\_system#Use\\_in\\_education](https://en.wikipedia.org/wiki/Computer_algebra_system#Use_in_education).

*SchoolhouseTeachers.com note: Parents should closely monitor children's use of YouTube and Wikipedia if you navigate away from the videos and articles cited in these lessons. We also recommend viewing the videos on a full-screen setting in order to minimize your students' exposure to potentially offensive ads and inappropriate comments beside or beneath the video.*

An online graphing calculator is available at <https://www.desmos.com/calculator>. Tutorials and a help center are available from <https://learn.desmos.com/>. A CAS calculator is available at <https://www.geogebra.org/cas?lang=en>. This is not allowable in some situations. Tutorials are available at <https://wiki.geogebra.org/en/Tutorials>.

You may also find extra help with Calculus by doing an Internet search for the specific topics. Look for clue words or phrases in the textbook—the section heading, for example—and then do a search for “calculus help about (section title).” Another possible resource might be the videos here: <https://www.utm.utoronto.ca/math-es-stats/1st-year-calculus-videos>.

Finally, please do not feel you have to print out the entire textbook. It contains over 600 pages in two PDF files. You might print selected pages here and there as you go along, but most of the time you should simply download the text to view on your computer. Use the “jump to” control at the top of the PDF to navigate to the correct page numbers.

The only pages which won't work accurately with the “jump to” controls are pages 1–6. That is because the PDF treats the first six pages as front matter, so it won't jump to the first six pages of the text. Simply scroll down through the first lesson, and once you reach page 7, you can use the navigation bar for the rest. (Note: to access the answer keys, you must use a capital A followed by the number without a space. “A1” will advance the PDF to the first page of the answer key, but “A(space)1” or “a1” will produce an error message.)

## Week 1: Chapter 0 – Welcome to Calculus

### Day 1

- Read the course introduction in these lessons, and then read page 1 of the textbook: Welcome to Calculus.
- Read the paragraph at the top of page A1 (the textbook answer key) about graphing and precision in the answers.
- Gather your supplies: a notebook, plenty of pencils and erasers, graph paper (optional), and a graphing calculator.

### Day 2

- Read pp. 1-6, Section 0.1 A Preview of Calculus.
- Pause while you are reading to do problems 1-4 on page 3 and problems 5-7 on page 5.
- When you are finished reading page 6, check your answers to the odd questions on page A1 (page 297 of the PDF).
- Suggested answers to the even questions are in the Extra Practice Answer Key.

### Day 3

- Note: The textbook presents  $\Delta x$  as “delta x.” That is accurate. It may be helpful, however, to train your mind to read  $\Delta x$  as “**the change in x.**” It describes in words what is happening in numbers.
- Read pp. 7–11 Section 0.2 Lines in the Plane.
- As you read, do the printed problems labeled Practice #1–6 (included in the reading – these are not the problems at the end of the section).
- Check your work to these practice problems on page 19.

## Day 4

- Read pp. 12–15.
- As you read, do Practice #7–9.
- Check your work to these practice problems on page 19.
- Do the odd problems from #1–11 on pp. 15–16.
- Check your work on pp. A1–A2.

## Day 5

- Do the odd problems from #13–29 on pp. 16–18.
- Check your work on page A2.
- Extra Practice: Do #26 on page 17. Check your work in the Extra Practice Answer Key.  
(Note: This reminder about the answer key applies to all future Extra Practice problems, so it won't be repeated.)

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