

Summary and Conclusion

Calculus I

College of the Atlantic. Fall 2024

Axioms

1. Mathematical potential is distributed equally among different groups, irrespective of geographic, demographic, and economic boundaries.
2. Everyone can have joyful, meaningful, and empowering mathematical experiences.
3. Mathematics is a powerful, malleable tool that can be shaped and used differently by various communities to serve their needs.
4. Every student deserves to be treated with dignity and respect.

Course Goals

1. Stay physically and mentally healthy and maintain intellectual and personal connection.
2. Experience the challenge, joy, and beauty of calculus and mathematics in general.
3. Improve your problem solving skills and mathematical confidence. Leave this course with an increased ability to do mathematics.
4. Gain a firm, grounded, enduring understanding of one of the big ideas of calculus: the derivative.
5. Be able to correctly perform mechanical calculations using the course content, apply problem solving skills to new areas, and effectively communicate problem solving strategies in writing.
6. Have fun while learning a lot.

Central Idea: The Derivative

1. Instantaneous velocity of $f(x)$
2. Instantaneous rate of change of $f(x)$
3. Slope of the tangent line of $f(x)$
4. $f'(x) = \text{Change ratio} = \frac{df}{dx} = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$

Other Ideas and Themes

1. The limit
2. New functions from old
3. Derivative interpretations
4. Shortcuts for calculating derivatives
5. Geometrical interpretations and concavity
6. Optimization applications
7. Implicit differentiation and related rates
8. Algebra and graphical reasoning practice

Four Course “Epochs”

- I. Tour of functions. New functions from old. Thinking globally about functions and their rates of change.
- II. The idea of the derivative. Different interpretations and definitions for the derivative. What the derivative means.
- III. Shortcuts to differentiation. Power rule, chain rule, product rule, etc.
- IV. Applications of the derivative. Finding local minima and maxima and inflection points. Optimization problems. Related Rates

Some numbers:

- I. 132 total WeBWorK problems
- II. 28 non-WeBWorK problems