

Summary and Conclusion

Calculus I

College of the Atlantic. Winter 2021

Course Goals

1. Stay physically and mentally healthy and maintain intellectual and personal connection in a time of dispersal and isolation.
2. Experience the challenge, joy, and beauty of calculus.
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 two of the big ideas of calculus: limits and 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. $f'(x) = \frac{df}{dx} = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$

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. Lots of 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. Marginality.