1.2.2 Overview of Topics

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Welcome to Calculus Applied! In this course, we go beyond the calculus textbook, working with practitioners in social, life and physical sciences to understand how calculus and mathematical models play a role in their work. Key topics include application of derivatives, integrals and differential equations, mathematical models and parameters.

Here are the case studies we'll work through in this course, using single-variable calculus.

- How standardized test makers use functions to analyze the difficulty of test questions;
- How economists model interaction of price and demand using rates of change, in a historical case of subway ridership;
- How an x-ray is different from a CT-scan, and what this has to do with integrals;
- How statisticians use functions to model data, like income distributions, and how integrals measure chance;
- How the Lotka-Volterra predator-prey model was created to answer a biological puzzle about fishing;
- How biologists use differential equation models to predict when populations will experience dramatic changes, such as extinction or outbreaks;
- How Einstein's Energy Equation $E = mc^2$ is an approximation to a more complicated equation.

You'll explore these situations in a hands-on way: looking at data and graphs, writing equations, doing calculus computations, and making educated guesses and predictions. To get started, check out the next section, where we will look more closely at the projectile motion model example Peter and Iuliana shared.

English