Math 1551 Learning Goals

Learning goals articulate what students are **expected to be able to do** in a course that can be measured. This course has **course-level** learning goals that pertain to the entire course, and **section-level** learning goals that pertain to sections of the course.

Course-Level Learning Goals

By the end of this course, it is expected that students will be able to do the following.

A) Construct mathematical expressions and graphs involving functions and their derivatives.

B) Compute mathematical quantities using differential calculus and interpret their meaning.

C) Analyze mathematical statements and expressions (for example, to assess whether a particular statement is accurate).

D) Write logical progressions of precise statements to justify and communicate mathematical reasoning.

E) Apply calculus concepts to solve real-world problems such as optimization and related rate problems.

For example, students will be expected to construct related rate equations to compute the value of a variable and interpret the resulting value in the context of the given problem.

Section-Level Learning Goals

Section-level learning goals are connected with particular sections of this course.

3.10 Related Rates

1. Solve related rate problems.

3.11 Linearization and Differentials

1. Construct differentials, and linearizations centered on a point.
2. Use differentials and linearizations to approximate function values, and to characterize how functions are changing near a given point.
3. Characterize the error made in a linear approximation.

Note that the textbook also explores sensitivity to change, which we won't have time to cover and students are not expected to know.

4 Applications of Derivatives

4.1 Extreme Values of Functions

1. Identify critical points and extreme values of a function.
2. Give an example, or sketch a function whose critical points, or local extrema, or global extreme values are given.

4.2 The Mean Value Theorem

1. Determine whether Rolle's Theorem and the Mean Value Theorem can be applied to a given function and interval.
2. Apply Rolle's theorem and the Mean Value Theorem to characterize the roots, or the rate of change of a function (for example, to identify where the derivative of a function is equal to a particular value).
3. Give examples of functions whose derivatives meet certain criteria by using the Mean Value Theorem.

4.3 Monotonic Functions, the First Derivative Test

1. Determine where a function is increasing or decreasing.
2. Classify critical points using the first derivative test.
3. Sketch functions using the first derivative and the first derivative test.

4.4 Concavity and Curve Sketching

1. Determine where a function is concave up or concave down.
2. Classify critical points using the second derivative test.
3. Sketch functions using characteristics such as concavity, intervals of increasing/decreasing, extrema, symmetry, intercepts, asymptotes, domain and range.