Midterm 2 Conceptual Review

Math 145, Fall 2017

- Midterm 2 is on Thursday, October 9 from 5:50 - 7:50 pm in our classroom.
- The exam will be cumulative, but will focus on §§**4.1 - 4.7 and** §§**5.1-5.2**.
- You may use both sides of a 3" x 5" **note card** (or paper) during the exam.
- You may use a calculator, but its use should **never** replace a method from class.
- You are **highly encouraged** to come to the instructor with questions! Look for **office hours** posted on the course website. If you can't attend them, feel free to **make an appointment**.

Linear approximation (§4.1)

- *Concepts*: Tangent line to a function at a point, linear approximation of a function using the derivative
- *Goals*: Find the tangent line to a function at a point, apply linear approximation to estimate answers to real-world problems
- *Homework problems*: §4.1: #11, 13, 23, 25, 27, 29, 35, 49
- *Additional practice problems*: §4.1: #7, 15, 17, 39, 41, 63, 65

Extreme values: minima and maxima (§§4.2, 4.3, 4.4)

- *Concepts*: Absolute/local minimum/maximum, existence of extrema of continuous functions on closed intervals, critical point, Fermat's theorem on local extrema, increasing/decreasing behavior of a function, first derivative test, second derivative test
- *Goals*: Determine where a function is increasing/decreasing, find critical points, find extreme values on a closed interval, determine local extrema (e.g., using first/second derivative tests)
- *Homework problems*: §4.2: #5, 11, 15, 24, 33, 51; §4.3: #31, 41, 43, 45, 53, 57, 61; §4.4: #31, 37, 39
- *Additional practice problems*: §4.2: #21, 23, 31, 41, 53, 61; §4.3: #39, 47, 51, 60; §4.4: #33, 35

Mean value theorem and Rolle's theorem (§§4.2, 4.3)

- *Concepts*: Rolle's theorem, Mean value theorem (MVT)
- *Goals*: Find an input satisfying MVT/Rolle's theorem, apply MVT/Rolle's theorem to prove a statement
- *Homework problems*: §4.2: #66, 67, 69; §4.3: #1, 3, 11, 65, 68
- *Additional practice problems*: §4.2: # 65, 70; §4.3: #7, 9, 67, 69

The shape of a graph/curve sketching (§§4.4, 4.6)

- *Concepts*: Concavity, inflection point, asymptotic behavior

- *Goals*: Determine where the graph of a function is concave up/down; find inflection points of a function; sketch a graph of a function using derivatives, including data on concavity, increasing/decreasing behavior, function values, asymptotes, and asymptotic behavior
- *Homework problems*: §4.4: #1, 5, 11, 13, 15, 45, 47, 51, 55; §4.6: #1, 3, 5, 7, 9, 11, 25, 33, 57, 37, 45, 53, 55, 57, 61, 65, 69, 77
- *Additional practice problems*: §4.4: #25, 41, 43, 49, 59; §4.6: #13, 15, 17, 19, 21, 43, 47, 54, 59, 63, 67

L'Hôpital's rule (§4.5)

- *Concepts*: L'Hôpital's rule for limits of indeterminate form approaching a finite number or $\pm\infty$, growth of a function
- *Goals*: Determine whether L'Hôpital's rule applies to a limit, apply L'Hôpital's rule, rewrite limits of indeterminate form to use L'Hôpital's rule, use logarithms and L'Hôpital's rule to find limits
- *Homework problems*: §4.5: #5, 9, 13, 16, 23, 43, 57, 69
- *Additional practice problems*: §4.5: #7, 15, 25, 27, 33, 39, 41, 61, 67

Applied optimization (§4.7)

- *Concepts*: Function modeling, optimization
- *Goals*: Solve a real-world problem by constructing a function, determining an appropriate domain, and finding a desired extreme value
- *Homework problems*: §4.7: #3, 5, 13, 15, 17, 19, 31, 33, 35, 37, 41, 59
- *Additional practice problems*: §4.7: #7, 9, 21, 25, 27, 39, 45, 53

Riemann sums, the area under a graph, and definite integrals (§§5.1 - 5.2)

- *Concepts*: Summation notation, Reimann sum, area under a graph between two x-values, definite integral,
- *Goals*: Manipulate sums written in summation notation, approximate the area under a graph using a Riemann sum, find the area under a graph by finding limits of Riemann sums, find a definite integral, interpret a definite integral as a signed area, understand and apply basic properties of definite integrals
- *Homework problems*: §5.1: #1, 7, 11, 13, 23, 25, 27, 31, 33, 41, 49, 53, 63, 65, 71, 73, 79; §5.2: #3, 7, 8, 11, 13, 16, 29
- *Additional practice problems*: §5.1: # 3, 9, 19, 29, 43, 54, 57, 61, 64; §5.2: #5, 9, 12, 25, 31