Things to Know for Math 140B Midterm Exam #2

Wednesday, November 5th

3.3 Curve Sketching with Asymptotes

- Understand methods to solve limits as x goes to ∞ and $-\infty$
- Know how to find x- and y- intercepts
- Understand how to find all types of asymptotes: vertical, horizontal (USING LIMITS!), and slant
- Understand how to find critical points and local extrema algebraically
- Understand how to identify intervals of increase and decrease of a function, both visually and algebraically
- Know how to identify points of inflection and concavity based on a graph
- Understand how to find points of inflection and intervals of concavity algebraically
- Be able to accurately graph basic functions by identifying intercepts, asymptotes, critical points, local extrema, points of inflection, intervals of increase/decrease, and intervals of concavity

3.4 Absolute Maximums and Minimums

- Understand the Extreme Value Theorem and the Minimum-Maximum Principles 1 and 2, as stated in the book.
- Understand the difference between an absolute max/min value and an absolute max/min point
- Know how to find an absolute maximum or minimum on a closed interval $[a, b]$
- Know how to prove that a critical point is an absolute maximum or minimum on an open interval (a, b)

3.5 Optimization

- Understand the necessary steps to solve an optimization problem
- Be able to draw and label an accurate picture
- Know how to glean appropriate equations from said picture
- Understand how to find an appropriate domain for the single-variable equation
- Understand how to apply principles of absolute maximums and minimums to answer the questions

3.6 Approximation Techniques (Linearization Only

- Understand how a Linearization and a tangent line are related
- Know how to find the linearization of a function $f(x)$ at a point $x = a$
- Know how to estimate a value using a linearization
- Be able to identify an appropriate function $f(x)$ and "anchor point" a when asked to estimate a value

3.7 Implicit Differentiation and Related Rates

- Understand the relationship between the chain rule and implicit differentiation
- Understand when to use implicit differentiation
- Know how to find the equation of a tangent line to a curve that is defined implicitly
- Understand the necessary steps to solve a related rates problem
- Understand how to identify rates of change within the problem and label them accurately
- Know when to plug in constant values and how to answer with appropriate units

Suggested Review Problems

- Chapter 3 Summary and Review (pages 257-258) - #3, 5, 9-28, 31-33, 35
- Chapter 3 Test (page 259) - #4, 5, 9-25, 28-30
- Relevant Problems from Sample Exams for regular Math 140 found here:
  `http://www.math.psu.edu/ug/courses/math140/sampleexams`
  Exam 1
  - Sample Exam A: #6-7, 17
  - Sample Exam B: #12, 21
  - Sample Exam C: #10, 12, 19
  - Sample Exam D: #13-14, 16-17

  Exam 2
  - Sample Exam A: #1-4, 8-11, 16, 18 (#6-7, 12, 15, 17)
  - Sample Exam B: #1-4, 8-11, 15 (#6-7, 12-14)
  - Sample Exam C: #1-2, 4-5, 10-11, 16 (#3, 7-9, 12-15)
  - Sample Exam D: #1, 8, 10-11, 19-20 (#2-3, 5-7, 9, 12-16, 18)
  - Sample Exam E: #1-2, 4, 7-8, 11-12, 16-17 (#3, 9-10, 13-15)

  Problems in parentheses provide review for some relevant topics but will NOT be covered explicitly on this exam!
- Please look over ALL graded homework (#7-9) as well!