REVIEW DOCUMENT FOR FINAL EXAM – MATH 141 (FALL 2003)

1. Chapter 1

(1) Section 1: Be able to work with sets written in inequality, interval, or set notation; know the definition and properties of the absolute value function; be able to draw lines in the plane as well as algebraically manipulate linear equations in point-slope, standard, and slope-intercept forms; be able to tell whether two lines are parallel, perpendicular, or neither; be able to give the equation of a circle, identifying its center and radius in so doing; know and be able to work with the six trigonometric functions; and be able to work with exponential and logarithmic functions.
(2) Section 2: Know what a function is, and what the terms image, domain, and range mean; know what a composite function is and how it is defined; be able to define, identify, give the domains of and draw polynomial, rational, power, exponential, logarithmic, and trigonometric functions; be able to work problems such as the one in Example 9 on pages 23 and 24, concerning radioactive decay; know what a one-to-one function is, and how to determine, both algebraically and geometrically, whether a function is one-to-one; know how to find the inverse of a one-to-one function, and how to graph a one-to-one function and its inverse on the same set of axes; know what a periodic function is.
(3) Section 3: Know how to translate functions vertically and horizontally, how to reflect functions about the x and y-axes, and how to stretch and compress functions; also, know how to transform power and exponential functions into linear functions, and how to graph the resulting linear transformations.

2. Chapter 2

(1) Section 1: Be able to both informally and formally define limits, as well as show that a certain limit equation holds using the formal definition of limit; also, know the limit laws and the results on page 63.
(2) Section 2: Know what the Comparison and Sandwich Theorems say, and know how to use these results; know the limits at the top of page 67.
(3) Section 3: Know how to take limits of rational functions as the independent variable approaches either ∞ or $-\infty$; also, know the limit on page 71.
(4) Section 4: Know and be able to apply the definitions of two-sided and one-sided continuity; know the boxed results on pages 77 and 78.
(5) Section 5: Know the definitions of absolute maximum, absolute minimum, and absolute extremum; know and be able to apply the Extreme Value Theorem and the Intermediate Value Theorem; be able to use the bisection method to find the root of an equation.

3. Chapter 3

(1) Section 1: Know and be able to use the formal definition of a derivative in calculating the derivative of a given function; be able to write the equation of the tangent line to the curve at a given point (page 93); know that if a function is differentiable at a point, it is continuous at that point (page 100).
(2) Section 2: Know and be able to use the Power, Constant Multiple, Sum, and Difference Rules for derivatives.
(3) Section 3: Know and be able to use the Product and Quotient Rules for derivatives.
(4) Section 4: Know and be able to use the Chain Rule for derivatives; be able to implicitly differentiate one variable with respect to another variable, and solve for the derivative; be able to do related rate problems; and be able to calculate higher derivatives of functions.

(5) Section 5: Be able to take derivatives of trigonometric functions.
(6) Section 6: Be able to take derivatives of exponential functions; know the limit formula on the bottom of page 133 (Formula 3.9).
(7) Section 7: Be able to calculate derivatives of inverse functions using Equation 3.11; know the derivatives of $\tan^{-1} x$ and $\sin^{-1} x$; be able to calculate derivatives of logarithmic functions; be able to perform logarithmic differentiation.
(8) Section 8: Be able to give the tangent line approximation to a differentiable curve at a given point (boxed portion, page 147); be able to calculate relative error and percentage error when estimating function values, and be able to do problems like those done on pages 150 and 151.

4. Chapter 4

(1) Section 1: Know what local maxima and local minima are, and be able to identify such; know what Fermat's Theorem says and be able to use it; know the guidelines for finding local extrema (page 161); know and be able to use the Mean Value Theorem and Rolle's Theorem, as well as Corollaries 1 and 2 to the MVT.
(2) Section 2: Know what a monotone function is, and how to use the first derivative of a function to tell when said function is increasing or decreasing on a given interval; know the definition of concavity and how to use the second derivative of a function to determine said function's concavity.
(3) Section 3: Know what a critical point of a function is and how to find one (page 177); know and be able to use the Second Derivative Test for Local Extrema; know what an inflection point of a function is and how to find one (page 183); know what horizontal, vertical, and oblique asymptotes of functions are, how to graph them and the circumstances under which said asymptotes appear.
(4) Section 4: Be able to solve optimization problems like those discussed in the text, as well as the ones you've worked on for homework or on graded events.
(5) Section 5: Know the seven indeterminate forms, and know what L'Hospital's Rule says; know that the rule only applies to indeterminate quotients, and that, if one encounters another type of indeterminate form, one must rewrite the function so as to obtain an indeterminate quotient before applying L'Hospital's Rule; be able to do problems like those done in the book, as well as the ones you've worked on for homework or on graded events.
(6) Section 7: Know what an antiderivative of a function is, and how to find particular and general antiderivatives of a given function; memorize the entries in Table 4.1; be able to do initial-value problems.

5. Chapter 5

(1) Section 1: Be able to approximate areas between curves using rectangles, using sigma notation if necessary; know the algebraic rules for manipulating sums (page 236); know the formulas for the sum of the first n positive integers, and the sum of the first n squares (page 249); know the definitions of partition, norm, Riemann sum, and definite integral, and be able to interpret definite integrals geometrically; know the properties of the Riemann integral given in Subsection 3.
(2) Section 2: Know and be able to apply the Fundamental Theorem of Calculus, Part 1, as well as Leibniz's Rule; know the definition of an indefinite integral; memorize the entries in Table 5.1; know and be able to use the Fundamental Theorem of Calculus, Part 2.
(3) Section 3: Be able to find areas between curves (including drawing all curves, highlighting the region(s) of interest, and labelling all pertinent points); be able to express the net, or cumulative, change of a function from one point to another in integral form; be able to

calculate the average value of a continuous function using the formula on page 272, and know the Mean Value Theorem for Definite Integrals.

6. Chapter 6

(1) Section 1: Know and be able to apply the Substitution Rule for Indefinite Integrals; know and be able to apply the Substitution Rule for Definite Integrals.
(2) Section 2: Know and be able to apply the rule for Integration by Parts.
(3) Section 3: Be able to perform partial fraction decomposition on a proper rational function whose denominator factors as the product of linear and/or quadratic factors (see the boxed portions on pages 302 and 304), and be able to subsequently integrate each part.

There will be ten to fifteen questions, each worth ten to fifteen points, for a total of 150 points.