Math 261
Exam 1 Review Sheet

Section 1.1 Algebra and Functions Review

- Understand lines, including slope, finding equations, parallel and perpendicular lines, and x and y - intercepts of lines.
- Be able to solve inequalities both algebraically and by using "sign testing".
- Know the definition of a function.
- Know how to interpret the graph of a function (including finding the domain, range, function values, and increasing/decreasing intervals).
- Know and be able to use interval notation.
- Understand and be able to graph piecewise defined functions.

Section 1.2 Combining Functions; Shifting and Scaling Graphs

- Be able to find formulas and values for combinations of functions (sums, differences, products, and quotients).
- Understand composition of functions and be able to compute values and find formulas for composite functions.
- Be able to find the domain of a combination of functions based on the domain of the original functions.
- Understand shifts of functions and be able to draw the graph of a function after applying one or more shifts.

Section 1.3 Trigonometry Review

- *Memorize* the key values of all six basic trig functions.
- Understand and be able to use inverse trig functions.
- Be able to solve trig equations and apply basic trig identities.
- Be able to graph various trig functions and be able to write the equation of a trig function when given its graph.

Section 2.1 Rates of Change and Tangents to Curves

- Understand the difference between an average rate of change and an instantaneous rate of change.
- Be able to find the average rate of change of a function over a given interval gives either a formula for the function or a graph of the function.
- Know the definition of a secant line between two points of a function. Also know the definition of the tangent line to a function at a given point.
- Be able to find the slope of the tangent line to a function using the method of example 3.

Section 2.2 Limit of a Function and Limit Laws

- Understand the intuitive idea of a limit.
- Know how to investigate limits by creating tables of values.
- Know how to find the value of a limit based on a graph.
- Know the properties of limits and be able to use them to find the limits of various combinations of functions.
- Know theorems about the limits of polynomial, rational functions, and roots of functions.
- Be able to compute limits using both theorems and algebraic methods.
- Know and be able to apply the Sandwich Theorem.
- Be able to find the limit of a piece-wise defined function.

Section 2.3 The Precise Definition of Limit

- *Memorize* the formal definition of a limit.
- Given a function and a specific ϵ value, be able to find a specific δ value based on the given ϵ value.
- Be able to prove the value of a limit using the formal definition.
- Know what it means for a limit to **not** exist.

Section 2.4 One-Sided Limits

- Know the definition of one - sided limits.
- Understand the connection between one sided limits and two-sided limits.
- Be able to compute one-sided limits of a function given either a formula or a graph.
- Know and be able to use the fact that $\lim\limits_{\theta \to 0} \dfrac{\sin \theta}{\theta} = 1$.

Section 2.5 Continuity

- Know the definition of continuity of a function at a point (internal or endpoint).
- Be able to classify points of discontinuity as removable, jump, infinite, or oscillatory discontinuities.
- Know the definition of continuity on an interval: (a, b) or $[a, b]$.
- Be able to determine the intervals where a given function $f(x)$ is continuous.
- Know theorems about the continuity of combinations of functions, polynomials, and rational functions.
- Be able to find and classify the points of discontinuity of a given function.
- Know and be able to apply the Intermediate Value Theorem.

Section 2.6 Limits Involving Infinity; Asymptotes

- Know the definition of limits involving infinity.
- Be able to compute limits as $x \to \pm\infty$.
- Be able to interpret one sided limits where the function goes to ∞ or $-\infty$.
- Be able to use limits to find the vertical, horizontal, and oblique asymptotes of a function.
- Be able to identify the dominant term of a rational function.