Math 261
Exam 4 Review Sheet

Section 4.7 Rectilinear Motion

- Understand the relationship between position, velocity, and acceleration.
- Be able to find equations for position, velocity, and acceleration given initial conditions.
- Be able to use these concepts to solve application problems involving projectile motion.

Section 4.8 Newton's Method

- Understand how to use Newton's method to approximate a zero of a function
- Be able to use Newton's method to approximate nth roots of numbers.

Section 5.1 and 5.2 Antiderivatives and Indefinite Integrals and Change of Variables in Definite Integrals

- Know the definition of an antiderivative of a function and how to find the indefinite integral of a function, including the arbitrary constant of integration.
- Understand integral notation.
- Know the properties of indefinite integrals, basic antidifferentiation formulas, and the inverse properties of integration and differentiation.
- Know how to solve differential equations by using initial conditions to solve for constants of integration.
- Know how to carry out a change of variables for a given indefinite integral.
- Know how to use the method of substitution to evaluate indefinite integrals.

Section 5.3 Summation Notation and Area

- Understand summation notation and the basic properties of sums.
- Memorize the summation formulas: $\sum_{k=1}^{n} k = \frac{n(n+1)}{2}$, $\sum_{k=1}^{n} k^2 = \frac{n(n+1)(2n+1)}{6}$, and $\sum_{k=1}^{n} k^3 = \left[\frac{n(n+1)}{2}\right]^2$ and be able to apply them to find the values of given sums.
- Understand how to use rectangular polygons to approximate the area under a continuous function on an interval $[a, b]$.
- Understand how to use sums and limits to find the exact area under a continuous function on an interval $[a, b]$.

Section 5.4 The Definite Integral

- Understand the definition of a partition P of a closed interval $[a, b]$ and the definition of the norm of a partition.
- Understand how to find the Riemann sum associated with a particular partition.
- Know the definition of the definition of a function f on an interval $[a, b]$ (i.e. the limit of Riemann sums on the interval as the norm $\|P\| \to 0$, provided the limit exists).
- Understand the connection between the definite integral and area under a function, the fact that continuous functions are integrable, and that not every function is integrable on a given interval.

Section 5.5 Properties of the Definite Integral

- Know the basic properties of definite integrals and be able to apply them to specific situations.
- Memorize the Mean Value Theorem for definite integrals and be able to apply it to a specific function on a given interval.
- Be able to find the average value of a function on a given interval.

Section 5.6 The Fundamental Theorem of Calculus

- Memorize both parts of the statement of the fundamental theorem of calculus.
- Be able to apply the fundamental theorem of calculus to compute definite integrals of continuous functions.
- Use the method of substitution to compute definite integrals.
- Understand the properties of definite integrals of even and odd functions on intervals of the form $[-a, a]$.
- Understand the relationship between differentiation and definite integrals.

Section 5.7 Numerical Integration

- Know how to estimate a definite integral using the Trapezoid Rule.
- Know how to estimate a definite integral using the Simpson's Rule.
- Know how to estimate the error for approximations of definite integrals using the Trapezoid Rule and Simpson's Rule.