Math 262
Exam 3 Review Sheet

Section 9.3 Trigonometric Substitutions

• Understand and be able to carry out the basic process of trigonometric substitution.
• Understand the integral forms where each type of trigonometric substitution is useful.
• Understand how to translate the results of carrying out a trigonometric substitution back in terms of the original variable.

Section 9.4 Integral of Rational Functions

• Be able to carry out long division of polynomials and know when to apply this procedure to an integrand (when the degree of the numerator of a rational function is greater than or equal to that of the denominator).
• Understand how to find the partial fractions decomposition of a rational function whose denominator factors (for both linear and quadratic factors).
• Understand how to combine long division, partial fractions, algebra, inverse trigonometric functions, and trigonometric substitution to integrate various rational functions.

Section 9.5 Integrals Involving Quadratic Expressions

• Understand how to use completing the square to change the form of an integral involving a quadratic term.
• Be able to recognize which of our previous integration methods can be applied to integrate a rational function after completing the square.

Section 9.6 Miscellaneous Substitutions

• Be able to use more creative substitution methods in order to integrate functions, such as using "shift substitutions" and using power function substitutions to eliminate roots.

Section 10.1 and 10.2 Indeterminate Forms and L'Hôpital's Rule.

• Understand the hypotheses of L'Hôpital's Rule and be able to verify whether or not a given limit can be evaluated using L'Hôpital's Rule. [basic forms: $\frac{0}{0}$, $\frac{\infty}{\infty}$]
• Be able to change the form of a limit so that L'Hôpital's Rule can be applied to evaluate it. [basic forms: $0 \cdot \infty$, $\infty - \infty$, 0^0, 1^∞, ∞^0]
• Be able to compute a variety of limits using standard methods and/or L'Hôpital's Rule

Section 10.3 and 10.4 Improper Integrals

• Be able to use limits to determine whether or not an integral with an infinite limit of integration converges or diverges.
• Be able to use limits to determine whether or not an integral with an infinite integrand [for example, a function on an interval containing a vertical asymptote] converges or diverges.
• Be able to use limits to determine whether or not an integral that has more than one type of improperness converges or diverges.
• Be able to *comparisons* to determine whether or not an improper integral converges or diverges.