

Math 262  
Exam 3 Review Sheet

**Section 9.2** Trigonometric Integrals

- Understand how to rewrite integrands involving trigonometric functions using Pythagorean identities.
- Understand how to rewrite integrands involving trigonometric functions using half angle (power reduction) identities.
- Be able to evaluate various integrals involving powers of  $\sin x$ ,  $\cos x$ ,  $\sec x$  and  $\tan x$ .

**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** Integrals 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 irreducible quadratic factors).
- Understand how to combine long division, partial fractions, algebra, and inverse trigonometric functions 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 complicated substitution methods in order to integrate functions.
- *Not tested:* You will not be responsible to use the polynomial substitutions from Theorem 9.6. You also will not be asked to use the “sum to product” identities.

**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:  $0 \cdot \infty$ ,  $\infty - \infty$ ,  $0^0$ ,  $1^\infty$ ,  $\infty^0$ ]
- 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 impropriety converges or diverges.
- Be able to *comparisons* to determine whether or not an improper integral converges or diverges.