

The least you need to know for Midterm I

- Read hand-outs
- Integration by parts: Formula, make integrals easier, or rewrite afterwards to get the original integral back with constant factor not equal to 1, so you get equation for the integral.
- Trigonometric Integrals, strategies in the book, trig identities, double angle, half angle. Standard integrals of all the trig functions sin, cos, tan, sec, cot, csc.
- Trig substitution for $\sqrt{u^2 + 1}$, $\sqrt{u^2 - 1}$, $\sqrt{1 - u^2}$, which substitution on which interval and what identity do you use to simplify the result.
- Completing the square, so you can do a linear substitution to do a trig substitution after that.
- Rational functions, break rational functions up into polynomial and proper rational function using long division, breaking up proper rational functions in sum of proper rational functions of which denominators are powers of irreducible polynomials (i.e., linear polynomials or quadratic polynomials without real roots). Integrate rational functions.
- Trick of rationalizing substitutions.
- Simpson's approximation, formula of approximation plus upper bound of error term
- Midpoint Rule for approximation, idem dito.
- Trapezoid Rule for approximation, idem dito.
- How to find upper bounds for functions (to find K needed for upper bound of error term in approximation)
- How to find minimum number of intervals needed to get approximation within a certain bound.
- Definition of improper integrals, both types, what does it mean for them to converge? and diverge?
- When is $\int_1^\infty \frac{1}{x^p} dx$ convergent, when divergent?
- Comparison test for improper integrals. What are the conditions for the test? Show conditions are satisfied when you use the test.
- Integral to find arc length of a curve given by $y = f(x)$.
- Integral to find area of surface of revolution around x -axis.
- Integral to find area of surface of revolution around y -axis.
- Do lots of examples....