Test I Review

- **Test I is on §5.5-5.10 and Appendix G (skipping §5.8). I also assume you know how to differentiate and apply the fundamental theorem of calculus. Test I will be similar to the homework and/or lecture examples for the most part.**

1. Memorize the basic integrals on pg. 91.
2. Know how to integrate piece-wise defined functions. For example $\int_0^2 |x-1|\ dx =$?
3. Why do we say $\int \frac{1}{x}\ dx = \ln|x| + c$? Why are the absolute value bars required in general ?
4. U-substitution; see E1-E20 on pgs. 98-104.
5. Definite integrals involving U-substituion; see E15-E19 on pgs. 102-103.
6. Can you find $\int (\sin x)^n\ dx$ for $n = 1, 2, 3, 4, 5$? How about cosine?
7. Can you calculate $\int (\sec x)^n\ dx$ for $n = 1, 2, 3, 4$? See pg. 104 for $n = 1$, then $n = 2$ is easy however n=3 is challenging, and n=4 is not to bad since $sec^2x = tan^2x + 1$.
8. Trig-substitution; E1-E5 on pgs. 107-110. When do we usually need to do a trig-subst.? What are the triangles I draw good for in the trig-subst? Notice that the trig-substitutions are implicit; old variable = stuff in the new variable. As opposed to u-substitutions which are explicit; new variable = stuff in the old variable. Forgive my horrible grammar. thanks.
9. The product rule for integrals; integration by parts (IBP). See E1-E8 on pgs. 112-115. In applying the formula $\int u\ dv = uv - \int v\ du$ the main difficulty is deciding what u and dv should be. Common sense dictates that we must choose dv so that we can integrate it, also the heuristic rule L.I.A.T.E often gives a good choice for u. Usually the point of IBP is that $\int v\ du$ can be calculated whereas $\int u\ dv$ cannot (w/o IBP that is), however there are other examples where things loop back around like E6 or E8.
10. Partial Fractions; see E0-E6 pgs. 116-122. Obviously some of these are to long for the test, but I will test your general understanding of the method by questions like E4-E5. At most I'll ask you to solve one with A,B and C to the end (determine A,B and C then integrate)
11. Numerical Methods; which method converges quickest usually, trapezoid or Simpson's rule ?
12. Be able to define integrals to ∞ and $-\infty$. Then be able to evaluate these integrals. That means you need to know the limits of all the basic functions, which really means you should know their graphs. Be aware you will likely need to apply L'hopital's rule(see pg.59-62) to resolve indeterminant limits. See E1-E7 pgs 127-129.
13. How do you integrate near a vertical asympotote. See E8-E10 on pgs. 130-131. Take note of why the limit is required, also remember on the test to write limits where appropriate (do not omit them or bad things will happen to you.)
14. What is the geometric interpretation of the improper integrals ? When does an integral "converge"? When does an integral converge and diverge at once? How to do an integral with both types of impropreity (12. and 13. combined)