Name:

This quiz covers: 5.10 and Chapter 5 in general. DUE: Wednesday 2/22

Directions: Complete all questions and **show all applicable work.** Partial credit will be given.

1.) Find the integral:

$$\int_1^e \frac{\ln x}{x^2}\, dx$$

2.) Find the integral:

$$\int_0^\infty \frac{\ln x}{x}\, dx$$

3.) Explain what it means for an integral to converge. How about diverge?

4.) Does the following integral converge or diverge? Note that this cannot be integrated and requires the comparison test. See the end of Chapter 5.10.

$$\int_1^\infty \frac{\sin x}{x^2}\, dx$$

Answers

1.) Use integration by parts, with u=ln x and dv=xdx.

2.) Note: This requires splitting the integral by an arbitrary point (eg. 1) because the function is unbounded at 0, and the upper integrand it ∞. This gives the integral from 0 to 1 and from 1 to ∞. Evaluate each integral using limits.

3.) See Chapter 5.10

4.) This one is difficult because the function cannot be directly integrated. This requires the use of two other functions, namely $\frac{1}{x^2}$ and $\frac{-1}{x^2}$ utilizing the fact that $\frac{1}{x^2} > \frac{\sin x}{x^2} > \frac{-1}{x^2}$. Now since the integral of both of the new functions exist (ie. converge) and bound function of interest, the integral must converge as well.