Math 1b. Improper Integrals

Spring 2006

1. Evaluate $\int_1^t e^{-x}\,dx$. Does this integral make sense for all t? What if $t \to \infty$?

2. Evaluate $\int_1^t \frac{1}{x}\,dx$. Does this integral make sense for all t? What if $t \to \infty$?

3. Does $\int_1^\infty \frac{1}{x^2}\,dx$ converge? If so, to what?

4. Find all values of p such that the integral $\int_1^\infty \frac{1}{x^p}\,dx$ converges.

5. Does $\displaystyle\int_{-\infty}^{\infty} \frac{1}{1+x^2}\,dx$ converge? If so, to what?

6. Does $\displaystyle\int_{0}^{1} \frac{x}{\sqrt{1-x^2}}\,dx$ converge? If so, to what?

7. Does $\displaystyle\int_{1}^{\infty} \frac{1}{x^5+1}\,dx$ converge? Why or why not?

8. Does $\displaystyle\int_{0}^{\infty} \frac{1}{e^x+x}\,dx$ converge? Why or why not?

9. Does $\displaystyle\int_{1}^{\infty} \frac{\sin x}{x^2}\,dx$ converge? Why or why not?

10. Find all values of p such that the integral $\displaystyle\int_{1}^{e} \frac{1}{x(\ln)^p}\,dx$ converges.