
Improper Integrals

Solutions should show all of your work, not just a single final answer.

1. For $a > 0$, compute the improper integrals $\int_0^{\infty} e^{-ax} dx$ and $\int_0^{\infty} xe^{-ax} dx$. Express your answers in terms of a . (These computations are important in probability theory.)
2. Compute $\int_5^{\infty} \frac{dx}{x^2 - 4x + 3}$ using partial fractions. (You found an antiderivative of $1/(x^2 - 4x + 3)$ on an earlier worksheet.)
3. Decide if $\int_0^{\infty} \frac{x}{x^2 + 1} dx$ is convergent or divergent. If it is convergent, evaluate it.
4. Determine if $\int_1^{\infty} \frac{\cos x}{x^2} dx$ is convergent or divergent.
5. For which values of $p > 0$ is the integral $\int_2^{\infty} \frac{dx}{x(\ln x)^p}$ convergent?
6. T/F (with justification) The integral $\int_0^2 \frac{dx}{x-1}$ is convergent.