

IMPROPER INTEGRALS (no closed form)

1. Use graphs to answer the following questions.

If $\int_a^\infty f(x)dx = K$ and $0 < g(x) \leq f(x)$, what can we say about $\int_a^\infty g(x)dx$?

If $\int_a^\infty f(x)dx = K$ and $0 < f(x) \leq g(x)$, what can we say about $\int_a^\infty g(x)dx$?

If $\int_a^\infty f(x)dx$ diverges and $0 < f(x) \leq g(x)$, what can we say about $\int_a^\infty g(x)dx$?

If $\int_a^\infty f(x)dx$ diverges and $0 < g(x) \leq f(x)$, what can we say about $\int_a^\infty g(x)dx$?

2. Suppose we have an improper integral whose integrand does not have an antiderivative that can be expressed in closed form. Use the results from problem 1 to create a strategy for proving convergence or divergence of such an improper integral.

3. Determine if the following families of improper integrals converge or diverge.

A. $\int_a^{\infty} \frac{1}{x^p} dx$

B. $\int_0^a \frac{1}{x^p} dx$

4. Make a list of helpful inequalities or strategies for finding larger/ smaller functions.