

The Integral of $\frac{1}{x}$ and Friends

Complete this assignment and submit it to Gradescope by 4:00pm on your class day. You can print this sheet, or write on your own paper. Contact us if internet connections or other issues require alternate arrangements.

1. Evaluate $\int_1^\infty \frac{1}{x^p} dx$ where $p > 0$ is a constant.

$$\begin{aligned} \lim_{t \rightarrow \infty} \int_1^t x^{-p} dx &= \lim_{t \rightarrow \infty} \left[\frac{x^{1-p}}{1-p} \right]_1^t \\ &= \lim_{t \rightarrow \infty} \left(\frac{t^{1-p}}{1-p} - \frac{1}{1-p} \right) \\ &= \infty - \frac{1}{1-p} \\ &= \infty \end{aligned}$$

2. For which values of $p > 0$ does $\int_1^\infty \frac{1}{x^p} dx$ converge? For which values of $p > 0$ does it diverge?

It converges when $p > 1$. It diverges for $p \leq 1$

3. Which textbook sections will be on the exam? (Note: you can answer this question by looking at the materials on Canvas and in the lecture videos.)

5.1 - 5.6 + partial fractions in 5.7

One-Minute Questions: Write a sentence for each.

- A. What's one mathematical question you have after watching the videos?

How to take integrals of polar equations

- B. What's one interesting thing you learned from the book or videos?

I learned about the identity $\tan^2(x) = 1 + \sec^2(x)$