Mathematics 1120H – Calculus II: Integrals and Series
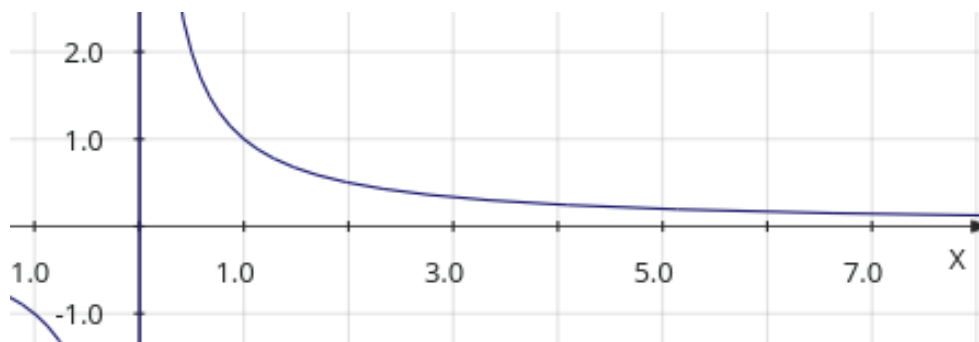Trent University, Winter 2024
Assignment #3
Area versus Volume
Due* just before midnight on Friday, 2 February.

Consider the region below the curve $y = \dfrac{1}{x}$ and above the x-axis for $1 \le x < \infty$, a piece of which you can colour in below.

1. Compute the area of the given region, both by hand and using SageMath. *[4]*

NOTE. You'll probably set up an integral of the form $\displaystyle\int_c^\infty f(x)\,dx$ where c is a constant. This kind of "improper integral" should be computed using a limit: $\displaystyle\int_c^\infty f(x)\,dx = \lim_{t\to\infty}\int_c^t f(x)\,dx$. That is, work out the definite integral first, then take the limit. For more about such integrals, which will encounter in class later on, you can check out §9.8 in the textbook, or the lectures on this topic from past iterations of 1120H on the archive page at: `http://euclid.trentu.ca/math/sb/calculus/`

2. Compute the volume of the solid obtained by revolving the given region about the x-axis, both by hand and using SageMath. *[4]*

3. There is something a little paradoxical about the (correct :-) answers to **1** and **2**. What is the paradox? Explain what's going on as best you can. *[2]*