This weightless assignment is due on Crowdmark by Monday, March 1, at 9:00pm EST. It does not count toward your course grade.

Exercise 1. Read Spivak Chapter 19, Appendix, "The Cosmopolitan Integral." Consider the functions

$$f(x) := \frac{1}{x}, \quad g(x) := \frac{1}{4}, \quad \text{on } [1, 2].$$

Let V_f and V_g be the solids of revolution obtained by rotating f and g around the x-axis, respectively.

- (a) What familiar shape is V_g ? Is V_f contained in V_g , or vice versa?
- (b) Suppose we take V_f and remove the portion V_g (imagine drilling a hole in V_f). Call this new shape V. Which integral equals the volume of V?

$$I_1 := \pi \int_1^2 \left(\frac{1}{x} - \frac{1}{4}\right)^2 dx, \qquad I_2 := \pi \int_1^2 \left(\frac{1}{x^2} - \frac{1}{16}\right) dx, \qquad I_3 := 2\pi \int_1^2 \left(1 - \frac{x}{4}\right) dx.$$

[Extra: one of the other integrals corresponds to the volume of a different solid obtained from f and g. Describe this solid.]