9. [12 points] Kyle wants to make a big ring, made by the rotation of the region bounded by
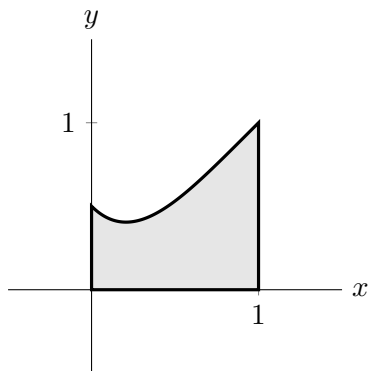
$$y = x + \frac{1}{2}(x - 1)^4, \; x = 0, \; x = 1, \text{ and } y = 0$$

about the line $x = -\frac{1}{2}$. This region is shown below. Both x and y are measured in centimeters.

a. [4 points] Write, but do not evaluate, an integral expression that gives the volume of Kyle's ring in cm^3.

Answer: _____

b. [4 points] The ring's density is given by $\ln(5r + 1)$ grams/cm^3, where r is the distance in centimeters from the central axis of the ring. Write, but do not evaluate, an integral expressing the total mass of Kyle's ring in grams.

Answer: _____

c. [4 points] John wants to use the same region to make a ring, but instead rotates the region around the line $y = -\frac{1}{2}$.
Write, but do not evaluate, an integral that gives the **volume** of John's ring in cm^3.

Answer: _____