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1. (5 points) A 1-dimensional rod is 4 meters long (starting at $x = 2$) and has density function $\rho(x) = \frac{5}{x}$ grams per meter. Find its mass. Include units in your final answer.

- 1

3. Consider the region bounded by the curves $y = 1 - x^2$ and $y = 0$. You may find the following helpful:

$$m = \rho \int_a^b f(x) dx, M_x = \rho \int_a^b \frac{(f(x))^2}{2} dx, M_y = \rho \int_a^b x f(x) dx$$

- (a) (8 points) Find the y coordinate of the centroid (center of mass).

- (b) (BONUS 2 points) Find the x coordinate of the centroid **without using calculus**. Briefly justify your answer.

4. (4 points) Compute the derivative of $f(x) = 5^{3x}$.