Week 3: Questions Taken From Past Midterms

1. Consider the region R bounded by the curves $y = x^2$, $y = 2 - x$.
   a. Find the area of R

   b. Find the volume of the solid obtained by rotating the region R in (a) about the line $y = -2$

2. Let R be the region above the x-axis, above the curve $y = \frac{1}{4}(x^2 - 1)$, and below the line $y = \frac{2}{3}x$.

   a. Express the area of R as an integral, or sum of integrals, of the form $\int_a^b f(x)dx$. Do not evaluate the integral(s).

   b. Express the area of R as an integral, or sum of integrals, of the form $\int_a^b f(y)dy$. Do not evaluate the integral(s).

   c. Evaluate the integral(s) in either (a) or (b) [take your pick] to find the area of R.

3. Let S be the region bounded by the curve $y = e^{\frac{x}{3}}$, the line $y = e$, and the y-axis.
   a. Find the volume of the solid obtained by revolving S about the x-axis.

   b. Set up an integral that represents the volume of the solid obtained by revolving S about the y-axis.

4. Consider the region between the curve $y = \sqrt{x - 1}$, $x \geq 1$, the x-axis, and the vertical line $x = 5$.
   a. Find the volume obtained from rotating the region about the x-axis

   b. Set up an integral for the volume of the solid obtained by rotating the region about the line $x = 3$. Do not evaluate the integral.