

Show all work. Arithmetic expressions need not be simplified.

1. **(5 points)** Find the area of the region between the curves $y = \sqrt{x-1}$ and $y = x-1$. You may find it helpful to sketch the curves.

2. **(12 points)** Below, we are considering the region enclosed by the curves $y = x^3 + 2$, $y = 1$, $x = 0$, and $x = 1$. You may find it useful to sketch the region.
 - (a) **(6 points)** Find the volume of the solid obtained by rotating this region around the x -axis.

 - (b) **(6 points)** Find the volume of the solid obtained by rotating this region around the y -axis.

3. **(3 points)** Determine the average value of $f(x) = \frac{1}{x^2}$ on the interval $[1, 3]$.

4. **(2 point bonus)** A solid has a height of h , and top and bottom faces which are the same shape but different sizes, having respective areas a and A . These faces are connected by straight lines. On the back of this sheet, determine the volume of the solid in terms of h , a , and A .