

Show all of your work, completely simplify your answer, and give exact values only.

1. Consider the solid whose base is the region inside the graph of $x^2 + 2y^2 = 1$ and whose cross sectional slices are semicircles that are perpendicular to both the xy -coordinate plane and the x -axis. Provide a graph of the base of this solid and determine this solid's volume.
2. Determine the area bounded by the graphs of the following two equations and sketch the graph of the region whose area you seek:

$$y = x^3 + 3 \text{ and } y = 3x + 1$$