1. Consider a 3-dimensional solid S where the base of S is the region enclosed by the parabola $y = 1 - x^2$ and the x-axis and cross-sections perpendicular to the x-axis are squares.

   (a) Sketch the region of the base of S and include a cross-section of S.

   (b) Find the area $A(x)$ of the cross section of S at x. (This is what we call an arbitrary cross-section.)

   (c) By integrating $A(x)$ over an appropriate interval, compute the volume of the solid S.

2. Consider a 3-dimensional solid S whose base is the triangular region with vertices $(0, 0)$, $(1, 0)$, and $(0, 2)$ and the cross-section perpendicular to the y-axis are equilateral triangles.

   (a) Sketch the region of the base of S and include a cross-section of S.

   (b) Find a formula for the area of an equilateral triangle with side-length a.

   (c) Using the formula from part (b), find the area $A(y)$ of the cross section of S at y.

   (d) By integrating $A(y)$ over an appropriate interval, compute the volume of the solid S.

3. Consider a 3-dimensional solid S whose base is the triangular region with vertices $(0, 0)$, $(2, 0)$, and $(0, 1)$ and the cross-section perpendicular to the x-axis are squares. Find the volume of S.

4. Find the volume of the solid S which is a right circular cone with height h and base radius r.

5. Find the volume of the solid S with radius r and the parallel cross-sections perpendicular to the base are squares.