

Volumes

Solutions should show all of your work, not just a single final answer.

1. Set up, but **do not evaluate**, a definite integral for the volume of the solid obtained by rotating the region bounded by the given curves about the specified line.
 - (a) $y = 3 - x$, $y = 0$, $x = 1$, $x = 2$; about the x -axis
 - (b) $y = x^4 - 2x^2 + 1$, $y = 2 - 2x^2$; about the x -axis
 - (c) $y^2 = x$, $x = 2y$; about the y -axis

2. A solid region has a circular base of radius 3 whose cross-sections perpendicular to the x -axis are equilateral triangles.
 - (a) Placing the circular base in the plane so it's centered at the origin, determine the side length of the cross-sectional triangle that passes through $(x, 0)$, for $-3 \leq x \leq 3$. (Your final answer will depend on x .) Draw a clear diagram in your solution.
 - (b) Set up, but **do not evaluate**, an integral equal to the volume of this solid region.
Hint: the area of an equilateral triangle with side length s is $\frac{s^2}{4}\sqrt{3}$.