

Problem Set 3

Consider the region \mathcal{D} bounded by the parabola $y = x^2$ and the line $y = 2x$ in the first quadrant. Represent the volumes of the following solids using a definite integral:

(a) The solid obtained by revolving \mathcal{D} about the line $y = 4$.

(b) The solid obtained by revolving \mathcal{D} about the line $x = 2$.

(c) The solid obtained by revolving \mathcal{D} about the line $y = -3$.

(d) The solid whose base is \mathcal{D} and whose perpendicular cross-sections are semi-circles with bases running parallel to the x -axis.

(e) The solid lies between planes perpendicular to the x -axis at $x = 0$ and $x = 2$. The cross-sections perpendicular to the x -axis between these planes are squares whose diagonals run from the parabola to the line. Find the volume of the solid.