1. Refer to the figure and consider the volume generated by rotating the given region about the specified line. For each subproblem below,

   (i) Use the diagram to setup a washer *volume element* (dV). Be sure to sketch an area element on region S and the graph of the given line.
   (ii) Set up (*but do not evaluate*) an integral to compute the volume of the solid obtained by rotating region S about the given line.

   (a) $\mathscr{R}_1$ about $\overline{OA}$

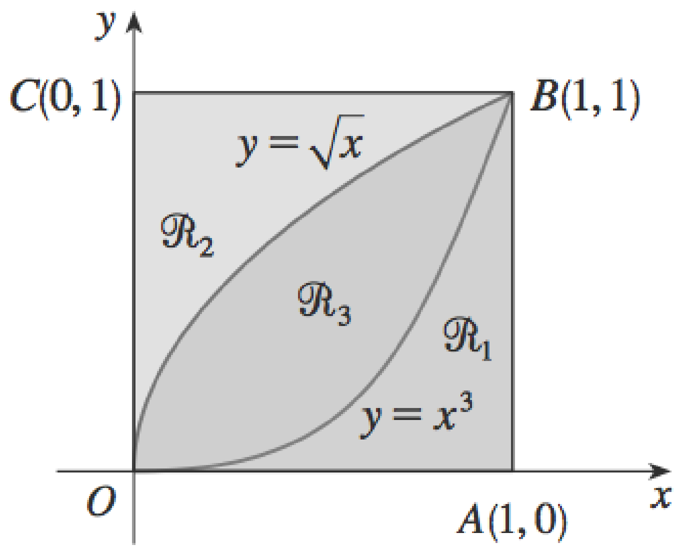
   (b) $\mathscr{R}_1$ about $\overline{AB}$

   (c) $\mathscr{R}_2$ about $\overline{OA}$

   (d) $\mathscr{R}_2$ about $\overline{AB}$

   (e) $\mathscr{R}_3$ about $\overline{OA}$

   (f) $\mathscr{R}_3$ about $\overline{AB}$



2. Repeat the previous question using cylindrical shells.

3. **Particle the Dog:** You are taking your dog (named Particle) for a walk. Like most dogs, Particle walks further than you do, even though you start and end in the same places. Unlike most dogs, Particle walks along a path described by a sine curve. As you walk along the x-axis, Particle moves along the curve $y = \sin x$, so that his x-coordinate changes at a constant rate of one unit per second. Assume that Particle starts at $(0, 0)$ and moves to the right. (Imagine moving along the x-axis at one unit per second, with Particle always staying directly above or below you on the curve)

   (a) Develop a *distance element*, dP, for computing Particle's distance. Use this to come up with a method to obtain how far Particle has walked at any point in time. [Note that you will not need to actually give a numerical answer to this part.]

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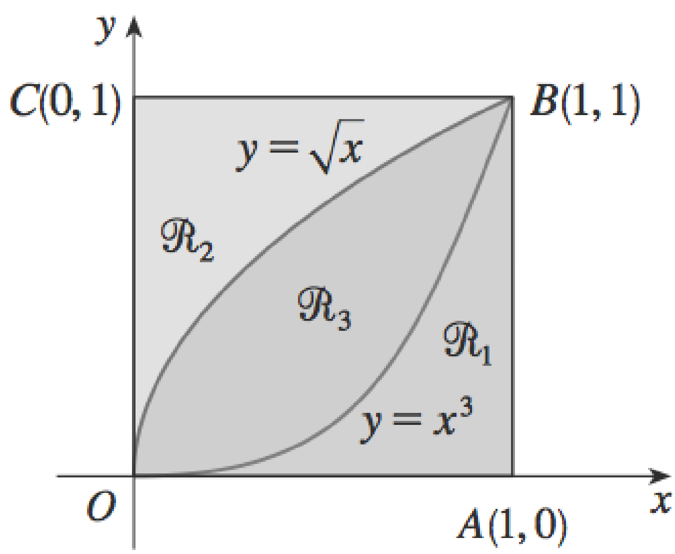

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