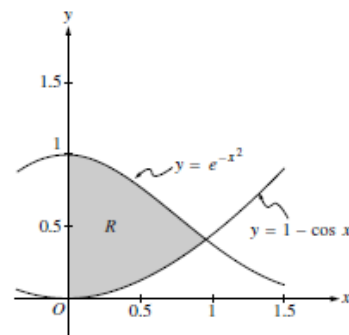


## AP Calculus

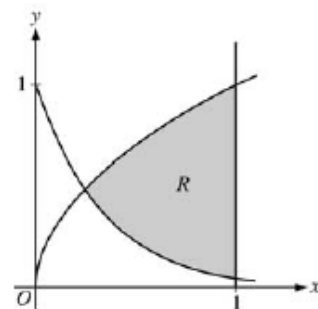
### GA5.1 – Area Between Curves and Volumes of Revolution

1. Let  $R$  be the shaded region in the first quadrant enclosed by the graphs of  $y = e^{-x^2}$ ,  $y = 1 - \cos x$ , and the  $y$ -axis, as shown in the figure above.
- Find the area of the region  $R$ .
  - Find the volume of the solid generated when the region  $R$  is revolved about the  $x$ -axis.
  - The region  $R$  is the base of a solid. For this solid, each cross section perpendicular to the  $x$ -axis is a square. Find the volume of this solid.



2. Let  $R$  be the region bounded by the  $x$ -axis, the graph of  $y = \sqrt{x}$ , and the line  $x = 4$ .
- Find the area of the region  $R$ .
  - Find the value of  $h$  such that the vertical line  $x = h$  divides the region  $R$  into two regions of equal area.
  - Find the volume of the solid generated when  $R$  is revolved about the  $x$ -axis.
  - The vertical line  $x = k$  divides the region  $R$  into two regions such that when these two regions are revolved about the  $x$ -axis, they generate solids with equal volumes. Find the value of  $k$ .

3. Let  $R$  be the shaded region bounded by the graphs of  $y = \sqrt{x}$  and  $y = e^{-3x}$  and the vertical line  $x = 1$ , as shown in the figure above.
- Find the area of  $R$ .
  - Find the volume of the solid generated when  $R$  is revolved about the horizontal line  $y = 1$ .
  - The region  $R$  is the base of a solid. For this solid, each cross section perpendicular to the  $x$ -axis is a rectangle whose height is 5 times the length of its base in region  $R$ . Find the volume of this solid.



4. Let  $R$  be the region enclosed by the graph of  $y = \sqrt{x-1}$ , the vertical line  $x = 10$ , and the  $x$ -axis.
- Find the area of  $R$ .
  - Find the volume of the solid generated when  $R$  is revolved about the horizontal line  $y = 3$ .
  - Find the volume of the solid generated when  $R$  is revolved about the vertical line  $x = 10$ .

## Solutions

1. a. 0.591      b. 1.747      c. 0.461

2. a. 5.333      b. 2.520      c. 25.133      d. 2.828

3. a. 0.443      b. 1.424      c. 1.554

4. a. 18      b. 212.058      c. 407.150