BC Calculus

Review #7 – Area

1996 AB2 (calculator allowed)

Let *R* be the region in the first quadrant under the graph of $y = \frac{1}{\sqrt{x}}$ for $4 \le x \le 9$.

(a) Find the area of *R*.

(b) If the line $x = k$ divides the region *R* into two regions of equal area, what is the value of *k*?

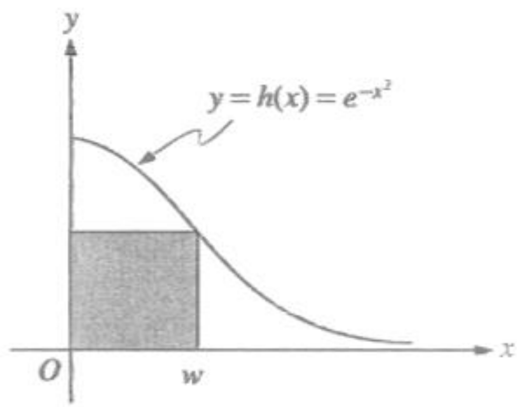
(c) Find the volume of the solid who base is the given region *R* and whose cross sections cut by planes perpendicular to the *x*-axis are squares.

1996 BC1 (calculator allowed)

Consider the graph of a function given by $h(x) = e^{-x^2}$ for $0 \le x < \infty$.

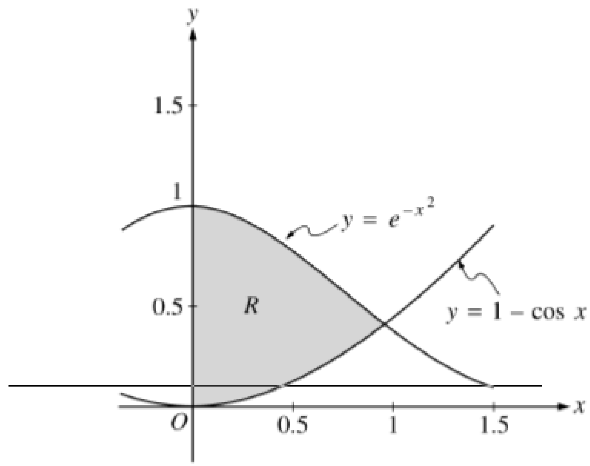
(a) Let *R* be the unbounded region in the first quadrant below the graph of *h*. Find the volume of the solid generated when *R* is revolved about the *y*-axis.

(b) Let *A(w)* be the area of the shaded region shown in the figure below. Show that *A(w)* has a maximum value when *w* is the *x*-coordinate of the point of inflection of the graph of *h*.



2000 AB1/BC1 (calculator allowed)

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.



(a)Find the area of region *R.*

(b)Find the volume of the solid generated when the region is revolved about the *x*-axis.

(c) The region 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.

1997 BC3 (calculator)

Let *R* be the region enclosed by the graphs of $y = \ln\left(x^2 + 1\right)$ and $y = \cos x$.

(a) Find the area of *R*.

(b) Write an expression involving one or more integrals that gives the length of the boundary of *R*. Do not evaluate.

(c) The base of a solid is region. Each cross section perpendicular to the *x*-axis is an equilateral triangle. Write an expression involving one or more integrals that gives the volume of this solid. Do not integrate.

1990 BC4 (calculator allowed)

Let *R* be the region inside the graph of the polar curve $r = 2$ and outside the graph of the polar curve $r = 2(1 - \sin\theta)$.

(a) Sketch the two polar curves and shade the region *r*.

(b) Find the area of *R*.

1993 BC4 (calculator allowed)

Consider the polar curve $r = 2\sin(3\theta)$ for $0 \le \theta \le \pi$.

(a) Sketch the curve.

(b) Find the area of the region inside the curve.

(c) Find the slope of the curve at the point where $\theta = \frac{\pi}{4}$.