# AP Calculus AB
# Set 7

**#1 (no calculator)**

Let $R$ be the region in the first quadrant under the graph of $y = \frac{x}{x^2+2}$ for $0 \le x \le \sqrt{6}$ ?

(a) Find the area of $R$.

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

(c) What is the average value of $y = \frac{x}{x^2+2}$ on the interval $0 \le x \le \sqrt{6}$ ?

**#2 (no calculator)**

Let R be the region in the first quadrant enclosed by the graphs of $y = 4 - x^2$, $y = 3x$, and the y-axis.

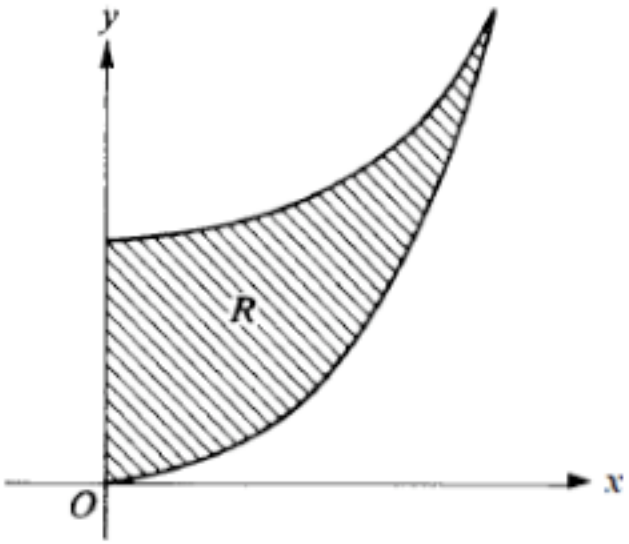
a. Find the area of the region R.
b. Find the volume of the solid formed by revolving the region R about the x-axis.

**#3 (no calculator)**

Let R be the region in the first quadrant that is enclosed by the graph of $y = \tan(x)$, the x-axis, and the line $x = \frac{\pi}{3}$.

a. Find the area of R.
b. Find the volume of the solid formed by revolving R about the x-axis.

**#4 (no calculator)**




The region enclosed by the graphs of $y = \tan^2 x$, $y = \frac{1}{2}\sec^2 x$, and the y-axis.

a. Find the area of the region R.
b. Set up, but do not integrate, an integral expression in terms of a single variable for the volume of the solid formed by revolving the region about the x-axis.

**#5 (no calculator)**

Let R be the region enclosed by the graphs of $\sqrt[4]{64x}$ and $y = x$.

a. Find the volume of the solid generated when region R is revolved about the x-axis.
b. Set up, but do not integrate, an integral expression in terms of a single variable the volume of the solid generated when the region R is revolved about the y-axis.

**#6 (no calculator)**

Let R be the region enclosed by the graphs of $y = e^x$, $y = (x - 1)^2$, and the line $x = 1$.

a. Find the area of R.
b. Find the volume of the solid generated when R is revolved about the x-axis.

**#7 (no calculator)**

Let $R$ be the region between the graphs of $y = 1 + \sin(\pi x)$ and $y = x^2$ from $x = 0$ to $x = 1$.

(a) Find the area of $R$.

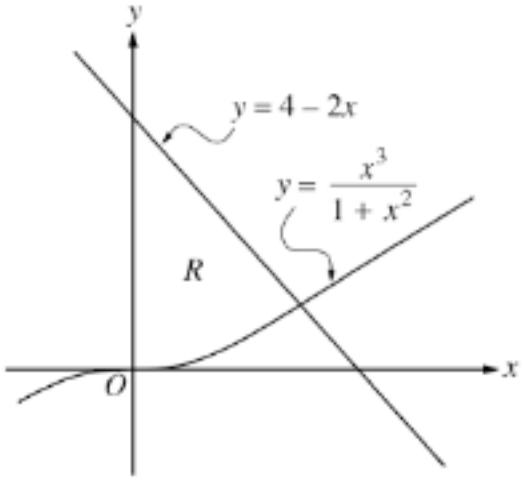
(b) Set up, but do not integrate an integral expression in terms of a single variable for the volume of the solid generated when $R$ is revolved about the $x$-axis.

**#8 (no calculator)**

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 it is the value of k?
d. Find the volume of the solid whose base is the region R and whose cross sections cut by planes perpendicular to the x-axis are squares.

**#9 (calculator)**



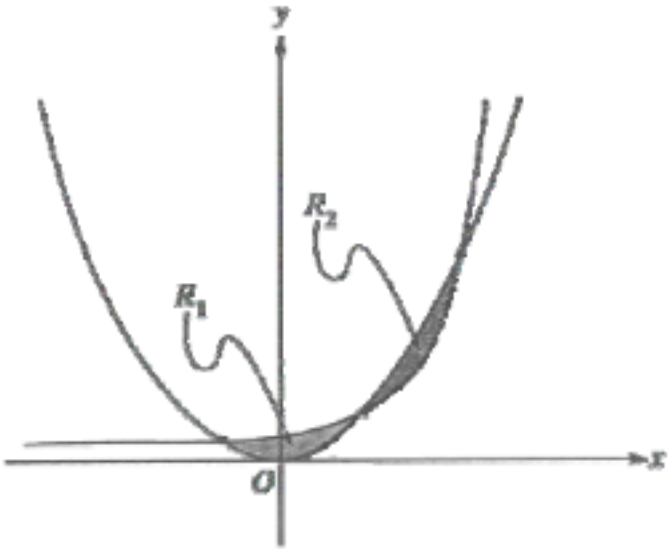

Let $R$ be the region bounded by the $y$-axis and the graphs of $y = \frac{x^3}{1 + x^2}$ and $y = 4 - 2x$, as shown in the figure above.

(a) Find the area of $R$.

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

(c) 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.

**#10 (calculator)**




Note: Figure not drawn to scale.

The shaded regions $R_1$ and $R_2$ shown above are enclosed by the graphs of $f(x)=x^2$ and $g(x)=2^x$.

(a) Find the $x$- and $y$-coordinates of the three points of intersection of the graphs of $f$ and $g$.

(b) Without using absolute value, set up an expression involving one or more integrals that gives the total area enclosed by the graphs of $f$ and $g$. Do not evaluate.

(c) Without using absolute value, set up an expression involving one or more integrals that gives the volume of the solid generated by revolving the region $R_1$ about the line $y=5$. Do not evaluate.

**#11 (calculator)**

Let R be the region enclosed by the graph of $y=\sqrt{x-1}$, the vertical line x = 10, and the x-axis.

a. Find the area of R.
b. Find the volume of the solid generated when R is revolved about the horizontal line y = 3.
c. Find the volume of the solid generated when R is revolved about the vertical line x = 10.

**#12 (calculator)**

Let $R$ be the region enclosed by the graph of $y = \ln x$, the line $x = 3$, and the $x$-axis.

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

(b) Find the volume of the solid generated by revolving region $R$ about the $x$-axis.

(c) Set up, but do not integrate, an integral expression in terms of a single variable for the volume of the solid generated by revolving region $R$ about the line $x = 3$.