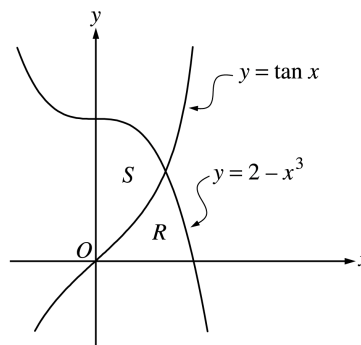


AP[®] CALCULUS AB
2001 SCORING GUIDELINES

Question 1

Let R and S be the regions in the first quadrant shown in the figure above. The region R is bounded by the x -axis and the graphs of $y = 2 - x^3$ and $y = \tan x$. The region S is bounded by the y -axis and the graphs of $y = 2 - x^3$ and $y = \tan x$.



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

Point of intersection

$$2 - x^3 = \tan x \text{ at } (A, B) = (0.902155, 1.265751)$$

(a) Area $R = \int_0^A \tan x \, dx + \int_A^{\sqrt[3]{2}} (2 - x^3) \, dx = 0.729$

or

$$\text{Area } R = \int_0^B ((2 - y)^{1/3} - \tan^{-1} y) \, dy = 0.729$$

or

$$\text{Area } R = \int_0^{\sqrt[3]{2}} (2 - x^3) \, dx - \int_0^A (2 - x^3 - \tan x) \, dx = 0.729$$

(b) Area $S = \int_0^A (2 - x^3 - \tan x) \, dx = 1.160$ or 1.161

or

$$\text{Area } S = \int_0^B \tan^{-1} y \, dy + \int_B^2 (2 - y)^{1/3} \, dy = 1.160 \text{ or } 1.161$$

or

$$\begin{aligned} \text{Area } S &= \int_0^2 (2 - y)^{1/3} \, dy - \int_0^B ((2 - y)^{1/3} - \tan^{-1} y) \, dy \\ &= 1.160 \text{ or } 1.161 \end{aligned}$$

(c) Volume $= \pi \int_0^A ((2 - x^3)^2 - \tan^2 x) \, dx$
 $= 2.652\pi$ or 8.331 or 8.332

3 : { 1 : limits
1 : integrand
1 : answer

3 : { 1 : limits
1 : integrand
1 : answer

3 : { 1 : limits and constant
1 : integrand
1 : answer