

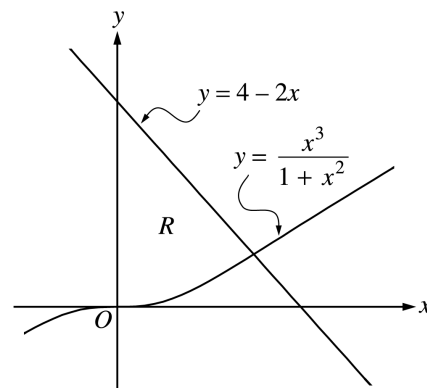
AP[®] CALCULUS AB
2002 SCORING GUIDELINES (Form B)

Question 1

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.



Region R

$$\frac{x^3}{1+x^2} = 4 - 2x \text{ at } x = 1.487664 = A$$

(a) Area = $\int_0^A \left(4 - 2x - \frac{x^3}{1+x^2} \right) dx$
 = 3.214 or 3.215

(b) Volume
 = $\pi \int_0^A \left((4 - 2x)^2 - \left(\frac{x^3}{1+x^2} \right)^2 \right) dx$
 = 31.884 or 31.885 or 10.149π

(c) Volume = $\int_0^A \left(4 - 2x - \frac{x^3}{1+x^2} \right)^2 dx$
 = 8.997

1 : Correct limits in an integral in (a), (b), or (c).

2 { 1 : integrand
 1 : answer

3 { 2 : integrand and constant
 < -1 > each error
 1 : answer

3 { 2 : integrand
 < -1 > each error
 note: 0/2 if not of the form
 $k \int_c^d (f(x) - g(x))^2 dx$
 1 : answer