

Answers

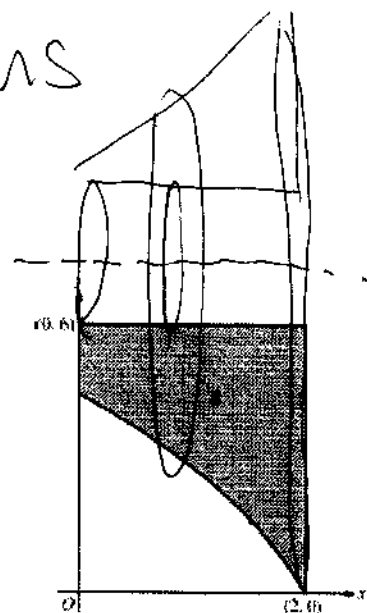
Volume and Area AP Problems – Mixed Practice

AP Calculus

Name:

- 1) In the figure above, R is the shaded region in the first quadrant bounded by the graph of $y = 4 \ln(3 - x)$, the horizontal line $y = 6$, and the vertical line $x = 2$.

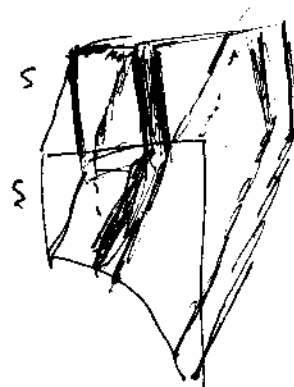
- (a) Find the area of R .
 (b) Find the volume of the solid generated when R is revolved about the horizontal line $y = 8$.
 (c) The region R is the base of a solid. For this solid, each cross section perpendicular to the x -axis is a square. Find the volume of the solid.



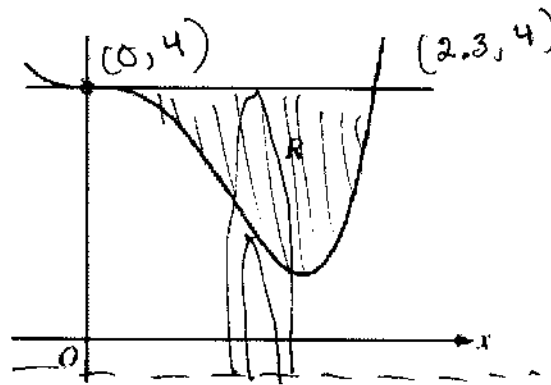
$$a) A = \int_0^2 (6 - 4 \ln(3-x)) dx = 6.817$$

$$b) V = \pi \int_0^2 ((8 - 4 \ln(3-x))^2 - (8-6)^2) dx = 168.180$$

$$c) V = \int_0^2 (6 - 4 \ln(3-x))^2 dx = 26.267$$



Area of each square = $(\text{side})^2$
 a



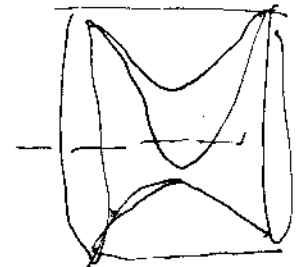
$$x^4 - 2.3x^3 + 4 = 0$$

$$x = 0, x = 2.3$$

2. Let R be the region enclosed by the graph of $f(x) = x^4 - 2.3x^3 + 4$ and the horizontal line $y = 4$, as shown in the figure above.
- Find the volume of the solid generated when R is rotated about the horizontal line $y = -2$.
 - Region R is the base of a solid. For this solid, each cross section perpendicular to the x -axis is an isosceles right triangle with a leg in R . Find the volume of the solid.
 - The vertical line $x = k$ divides R into two regions with equal areas. Write, but do not solve, an equation involving integral expressions whose solution gives the value k .

$$a) V = \pi \int_0^{2.3} ((4+2)^2 - (f(x)+2)^2) dx$$

$$\approx 98.868$$



$$b) V = \frac{1}{2} \int_0^{2.3} (4 - (x^4 - 2.3x^3 + 4))^2 dx$$

$$\approx 3.574$$



$$\text{Area of } \Delta = \frac{1}{2}bh$$

$$c) \int_0^K (4 - f(x)) dx = \int_K^{2.3} (4 - f(x)) dx$$

$$\text{or } \int_0^K (4 - (x^4 - 2.3x^3 + 4)) dx = \frac{1}{2} \int_0^{2.3} (4 - (x^4 - 2.3x^3 + 4)) dx$$