

AP Calculus AB Homework Problems

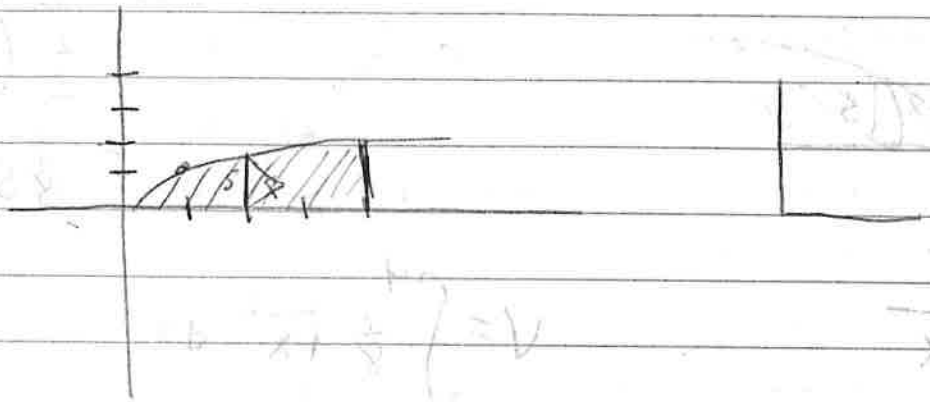
1) Find the volume of the solid formed by the functions $y = \sqrt{x}$ and $y = 0$ going from $x = 1$ to $x = 4$ with cross sectional shapes:

- a) Isosceles Right Triangles
- b) Semi-Circles
- c) Equilateral Triangles

2) SET UP ONLY: Find the volume of the solid formed by the functions $y = x$ and $y = x^2$ with cross sectional shapes:

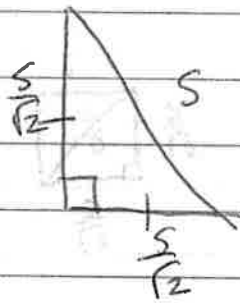
- a) Squares with diagonals perpendicular to x-axis
- b) Circles
- c) $30^\circ - 60^\circ - 90^\circ$ Triangle's with shortest side perpendicular to x-axis

① $y = \sqrt{x}$ $y = 0$ $x = 1$ to $x = 4$



② Isos. Rt Δ s
 • hyp on surface

$S = \sqrt{x} - 0$



$A = \frac{1}{2} \left(\frac{S}{\sqrt{2}}\right)^2$

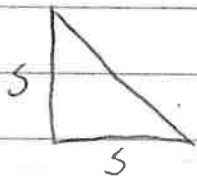
$A = \frac{1}{4} S^2$

$$V = \int_1^4 \frac{1}{4} (\sqrt{x})^2 dx = \frac{1}{4} \int_1^4 x dx = \frac{1}{4} \cdot \frac{1}{2} x^2 \Big|_1^4$$

$$= \frac{1}{8} [4^2 - 1^2]$$

• Leg on surface

$= \frac{15}{8} u^3$



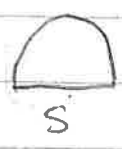
$A = \frac{1}{2} s^2$

$$V = \int_1^4 \frac{1}{2} \sqrt{x}^2 dx = \frac{1}{2} \int_1^4 x dx = \frac{1}{2} \cdot \frac{1}{2} x^2 \Big|_1^4$$

$$= \frac{1}{4} [4^2 - 1^2] = \frac{15}{4} u^3$$

1b

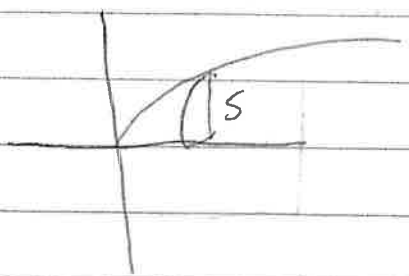
~~(B)~~ Semicircle



$$A = \frac{1}{2} r^2$$

$$= \frac{1}{2} \left(\frac{1}{2}s\right)^2$$

$$= \frac{1}{8} s^2$$



$$s = \sqrt{x}$$

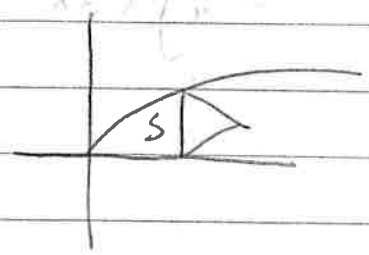
$$V = \int_1^4 \frac{1}{8} \sqrt{x}^2 dx$$

$$V = \frac{1}{8} \int_1^4 x dx$$

$$= \frac{1}{8} \left. \frac{1}{2} x^2 \right|_1^4$$

$$= \frac{1}{16} (4^2 - 1^2) = \frac{15\sqrt{3}}{16}$$

(C) Eq. Δ



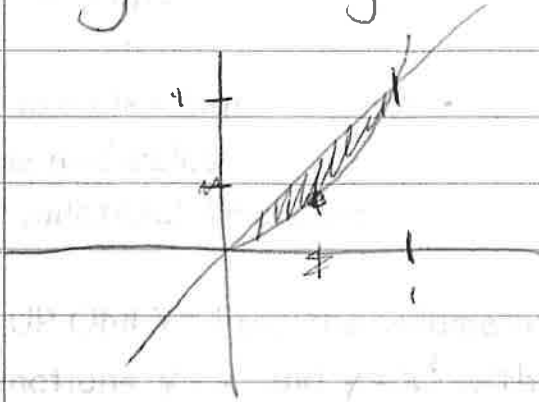
$$A = \frac{\sqrt{3}}{4} s^2$$

$$V = \int_1^4 \frac{\sqrt{3}}{4} (\sqrt{x})^2 dx$$

$$= \frac{\sqrt{3}}{4} \cdot \frac{1}{2} x^2 \Big|_1^4 = \frac{\sqrt{3}}{8} [4^2 - 1^2] = \frac{15\sqrt{3}}{8}$$

(2)

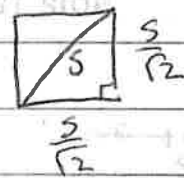
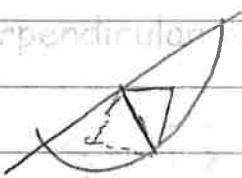
$$y = x \quad y = x^2$$



$$\begin{aligned} x &= x^2 \\ x^2 - x &= 0 \\ x(x-1) &= 0 \\ x &= 0 \quad x=1 \end{aligned}$$

$$S = x - x^2$$

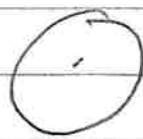
(a)



$$A = \left(\frac{s}{\sqrt{2}}\right)^2 = \frac{s^2}{2}$$

$$V = \int_0^1 \frac{(x-x^2)^2}{2} dx$$

(b) Circle:



$$A = \pi r^2$$

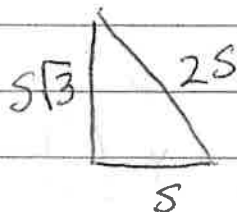
$$\begin{aligned} d &= s \\ r &= \frac{s}{2} \end{aligned}$$

$$\int_0^1 \frac{1}{4} \pi (x-x^2)^2 dx$$

$$\begin{aligned} A &= \pi \left(\frac{s}{2}\right)^2 \\ &= \frac{s^2 \pi}{4} \end{aligned}$$

(c)

$$\int_0^1 \frac{1}{2} (x-x^2)^2 \sqrt{3} dx$$



$$\begin{aligned} A &= \frac{1}{2} s \cdot s\sqrt{3} \\ &= \frac{1}{2} s^2 \sqrt{3} \end{aligned}$$