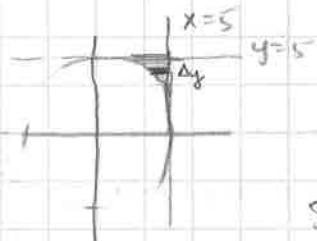


Chapter 5 Review

1.

Washer disk

$$R(y) = 5 \quad r(y) = \sqrt{25-y^2}$$



$$x^2 + y^2 = 25$$

$$x = \pm \sqrt{25-y^2}$$

$$y = \pm \sqrt{25-x^2}$$

$$V = \pi \int_0^5 [5^2 - (25-y^2)^2] dy$$

$$= \pi \int_0^5 (25 - 25 + y^2) dy$$

$$= \pi \int_0^5 y^2 dy$$

$$= \pi \left[\frac{y^3}{3} \right]_0^5 = \boxed{\frac{125\pi}{3} D}$$

Best Method

Shell dx

$$r(x) = x \quad h(x) = 5 - \sqrt{25-x^2}$$

$$V = 2\pi \int_0^5 x (5 - \sqrt{25-x^2}) dx$$

$$= 2\pi \int_0^5 (5x - x\sqrt{25-x^2}) dx$$

$$= 2\pi \int_0^5 5x dx - 2\pi \int_0^5 x(25-x^2)^{1/2} dx$$

$$u = 25 - x^2$$

$$du = -2x dx$$

$$-\frac{1}{2} du = x dx$$

$$u(5) = 0$$

$$u(0) = 25$$

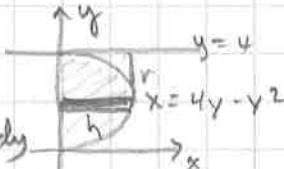
$$= 10\pi \int_0^5 x dx + \pi \int_{25}^0 u^{1/2} du$$

$$= 10\pi \left[\frac{x^2}{2} \right]_0^5 + \pi \cdot \frac{2}{3} u^{3/2} \Big|_{25}^0$$

$$= 125\pi + \frac{2}{3}\pi(-125) = 125\pi - \frac{250\pi}{3} = \frac{125\pi}{3}$$

2. Shell

$$V = 2\pi \int_0^4 (4-y)(4y-y^2) dy$$



$$= 2\pi \int_0^4 (16y - 4y^2 - 4y^2 + y^3) dy \quad r(y) = 4-y \\ h(y) = 4y - y^2$$

$$= 2\pi \int_0^4 (16y - 8y^2 + y^3) dy$$

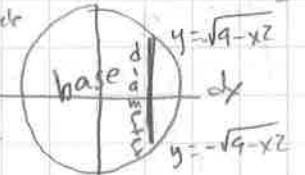
$$= 2\pi \left(8y^2 - \frac{8y^3}{3} + \frac{y^4}{4} \right) \Big|_0^4$$

$$= 2\pi \left(128 - \frac{512}{3} + 64 \right)$$

$$= 2\pi \left(\frac{64}{3} \right) = \boxed{\frac{128\pi}{3} C}$$

3. A = $\frac{\pi r^2}{2}$ semicircle

$$V = \frac{\pi}{2} \int_{-3}^3 (19-x^2)^{1/2} dx$$



$$V = \frac{\pi}{2} \int_{-3}^3 (9-x^2) dx$$

x-section
 $r = \sqrt{19-x^2}$

OR the interval

$$V = \pi \int_0^3 (9-x^2) dx$$

$$V = \pi \left(9x - \frac{x^3}{3} \right) \Big|_0^3$$

$$= \pi (27-9) = \boxed{18\pi C}$$

4.

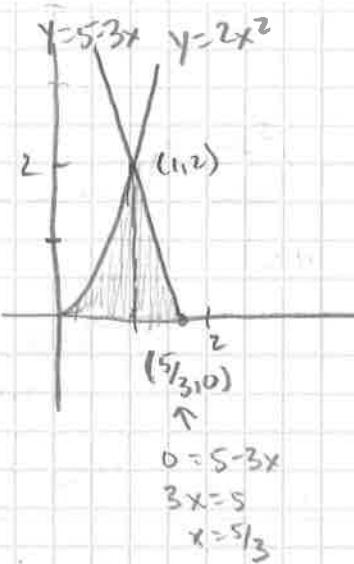
$$5-3x = 2x^2$$

$$2x^2 + 3x - 5 = 0$$

$$x = -\frac{5}{2}, x = 1$$

$\frac{5}{2}$ 1

Intersection



$$A = \int_0^1 2x^2 dx + \int_1^{\frac{5}{3}} (5-3x) dx$$

$$= \left[\frac{2x^3}{3} \right]_0^1 + \left[5x - \frac{3x^2}{2} \right]_1^{\frac{5}{3}}$$

$$= \frac{2}{3} + \left[\left(\frac{25}{3} - \frac{1}{2} \cdot \frac{25}{9} \right) - \left(5 - \frac{3}{2} \right) \right]$$

$$= \frac{2}{3} + \left(\frac{25}{3} - \frac{25}{6} - \frac{7}{2} \right)$$

$$= \frac{2}{3} + \frac{2}{3} = \boxed{\frac{4}{3}} \quad D$$

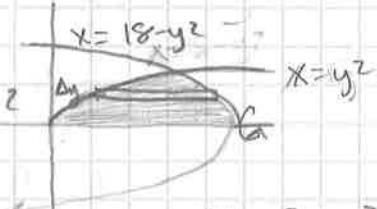
5. Shell dy

$$r(y) = y \quad h(y) = (18-y^2) - y^2$$

$$V = 2\pi \int_0^3 y (18-2y^2) dy$$

$$= 2\pi \int_0^3 (18y - 2y^3) dy$$

$$= 2\pi \left(9y^2 - \frac{y^4}{2} \right) \Big|_0^3$$



$$\begin{aligned} 18-y^2 &= y^2 \\ 18 &= 2y^2 \\ 9 &= y^2 \\ 3 &= y \end{aligned}$$

$$= 2\pi \left(81 - \frac{81}{2} \right) = 2\pi \left(\frac{81}{2} \right) = \boxed{81\pi} \quad A$$

FDR

← From intersection of graphs using calc.

$$A_1 = \int_0^{0.17821805} \left[4^{-x} - \frac{1}{4} - \sin(\pi x) \right] dx \approx 0.065$$

Do set up only

$$A_2 = \int_{0.17821805}^1 \left(\frac{1}{4} + \sin(\pi x) - 4^{-x} \right) dx \approx 0.410$$

$$C. \text{ Washer } R(x) = \frac{1}{4} + \sin(\pi x) - (-1) = \frac{5}{4} + \sin(\pi x) \quad r(x) = 4^{-x} - (-1) = 4^{-x} + 1$$

$$V = \pi \int_{0.17821805}^1 \left[\left(\frac{5}{4} + \sin(\pi x) \right)^2 - (4^{-x} + 1)^2 \right] dx \approx 4.559$$