



AP[®] Calculus AB 2002 Sample Student Responses Form B

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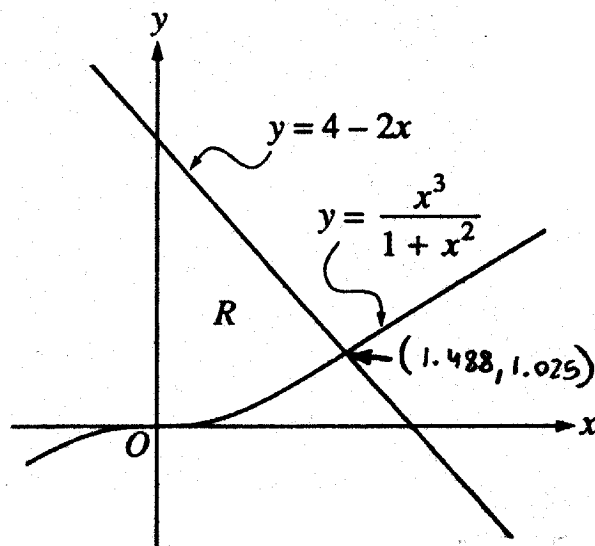
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CALCULUS AB
SECTION II, Part A

Time—45 minutes

Number of problems—3

A graphing calculator is required for some problems or parts of problems.



Work for problem 1(a)

$$\text{Limits of Integration: } 4 - 2x = \frac{x^3}{1 + x^2}$$

$$x = 0, 1.488$$

$$R = \int_0^{1.488} \left[4 - 2x - \left(\frac{x^3}{1 + x^2} \right) \right] dx \approx \boxed{3.215}$$

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A₂

Work for problem 1(b)



$$r_1 = 4 - 2x$$

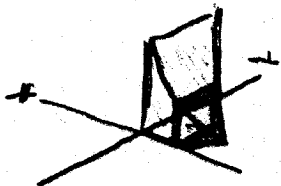
$$r_2 = \frac{x^3}{1+x^2}$$

$$V_R = \int \pi(r_1^2 - r_2^2) dx$$

$$= \pi \int_0^{1.498} \left[(4-2x)^2 - \left(\frac{x^3}{1+x^2} \right)^2 \right] dx$$

$$V_R \approx \boxed{31.885}$$

Work for problem 1(c)



$$A_{\square} = s^2$$

$$s = (4 - 2x) - \left(\frac{x^3}{1+x^2} \right)$$

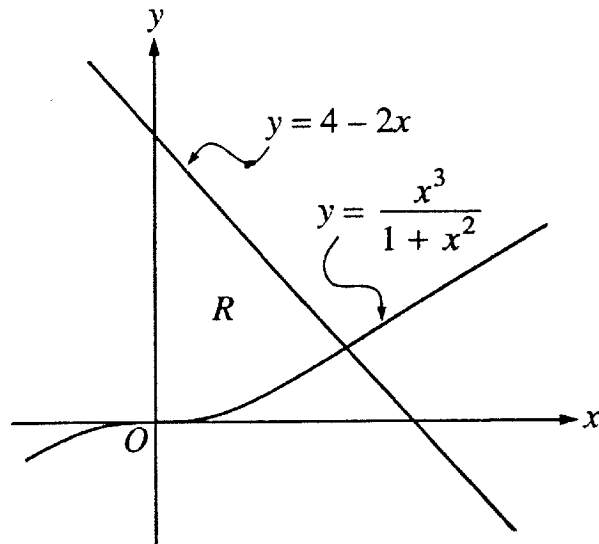
$$V_R = \int s^2 dx = \int_0^{1.498} \left[4 - 2x - \left(\frac{x^3}{1+x^2} \right) \right]^2 dx$$

$$\approx \boxed{8.997}$$

GO ON TO THE NEXT PAGE.

CALCULUS AB
SECTION II, Part A
 Time—45 minutes
 Number of problems—3

A graphing calculator is required for some problems or parts of problems.



Work for problem 1(a)

y_1 intersect y_2 at 1.4877

$$\int_0^{1.4877} 4 - 2x - \int_0^{1.4877} \frac{x^3}{1+x^2}$$

$$= 3.7375 - 0.5229 \quad (\text{used calculator})$$

$$= 3.215 \quad \text{units}^2$$

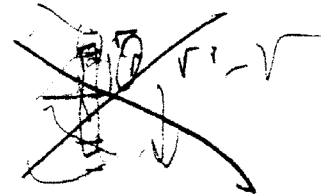
Work for problem 1(b)

$$\Delta V = \pi(r_1^2 - r_2^2) \Delta x$$

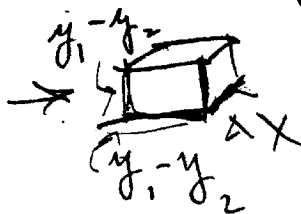
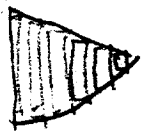
$$\Delta V = \pi \left[(4-2x)^2 - \left(\frac{x^3}{1+x^2} \right)^2 \right] \Delta x$$

$$V = \pi \int_0^{1.4177} \left[(4-2x)^2 - \left(\frac{x^3}{1+x^2} \right)^2 \right] dx$$

$$V = 320,694 \text{ units}^3 \text{ (used calculator)}$$



Work for problem 1(c)

~~Cross section~~

cross section

$$\Delta V = (y_1 - y_2)^2 \Delta x$$

$$\Delta V = \left[(4-2x) - \left(\frac{x^3}{1+x^2} \right) \right]^2 \Delta x$$

$$V = \int_0^{1.4177} \left[(4-2x) - \left(\frac{x^3}{1+x^2} \right) \right]^2 dx$$

$$V = 100.803 \text{ units}^3 \text{ (used calculator)}$$

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