AP® Calculus BC

2003 Sample Student Responses

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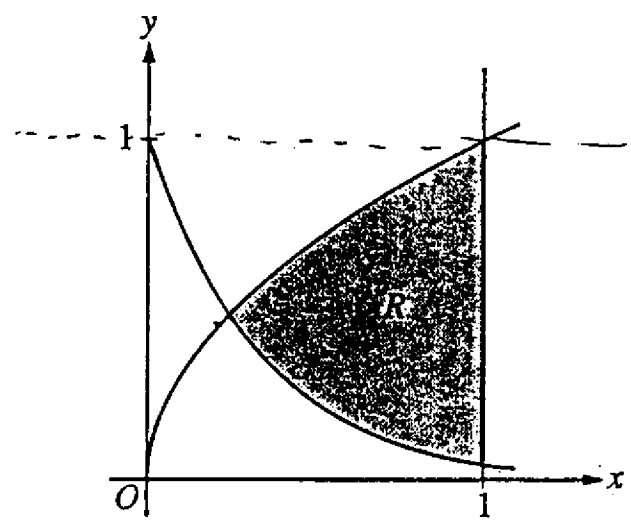
CALCULUS BC

SECTION II, Part A

Time—45 minutes

Number of problems—3

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



line of rotation for part B

Work for problem 1(a)

area of $R = A(R) = \int_{.239}^{1} \sqrt{x} - e^{-3x}\,dx$

$A(R) = .443$

intersect of $y=\sqrt{x}$ & $y=e^{-3x}$ is the lower bound for the integral!

$\sqrt{x} = e^{-3x}$

$x = .239$

Continue problem 1 on page 5.

Work for problem 1(b)

Volume of solid $= \pi \int_{.239}^{1} R^2 - r^2 \, dx$ $\quad R = 1 - e^{-3x}$ $\quad r = 1 - \sqrt{x}$

or

$$V = \pi \int_{.239}^{1} (1 - e^{-3x})^2 - (1 - \sqrt{x})^2 \, dx$$

$V = 1.424$

Work for problem 1(c)

$V = \int_{.239}^{1} h \cdot b \, dx$ $\quad h = 5b$ $\quad b = \sqrt{x} - e^{-3x}$

$h = 5(\sqrt{x} - e^{-3x})$

$$V = \int_{.239}^{1} 5(\sqrt{x} - e^{-3x})(\sqrt{x} - e^{-3x}) \, dx$$

$V = 1.554$

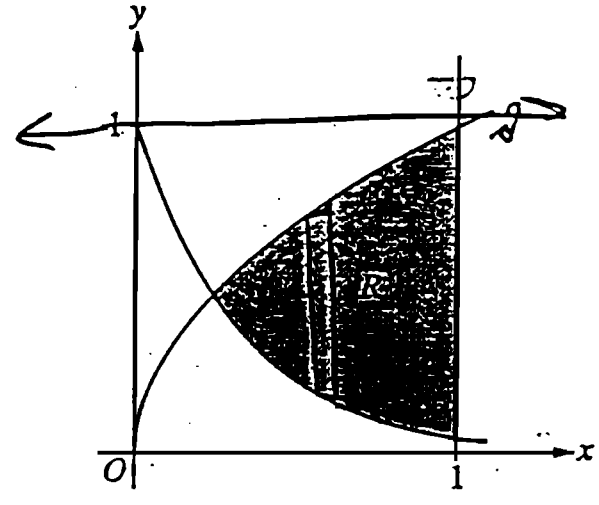
CALCULUS AB

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)

$$\text{Area} = \int_{.24}^{1} \sqrt{x} - e^{-3x}\, dx = .443 \text{ units}^2$$

Finding bounds: $\sqrt{x} = e^{-3x}$

$x \approx .24$

Continue problem 1 on page 5.

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Work for problem 1(b)

Found volume using Washer method $V = \pi \int_a^b R^2 - r^2 \, dr$

$$V(x) = \pi \int_{.24}^{1} (1 - e^{-3x})^2 - (1 - x^{1/2})^2 \, dx = 1.423 \text{ units}^3$$

Work for problem 1(c)

$\sqrt{x} - e^{-3x}$ = length of base

$5(\sqrt{x} - e^{-3x})$ = height

Area of Rec = base x height

$A = 5(\sqrt{x} - e^{-3x})^2$

To find Volume, integrate the area - use disc method

$$V = 5\pi \int_{.24}^{1} (\sqrt{x} - e^{-3x})^2 \, dx = 6.953 \text{ units}^3$$

GO ON TO THE NEXT PAGE.