



AP[®] Calculus BC

2003 Sample Student Responses

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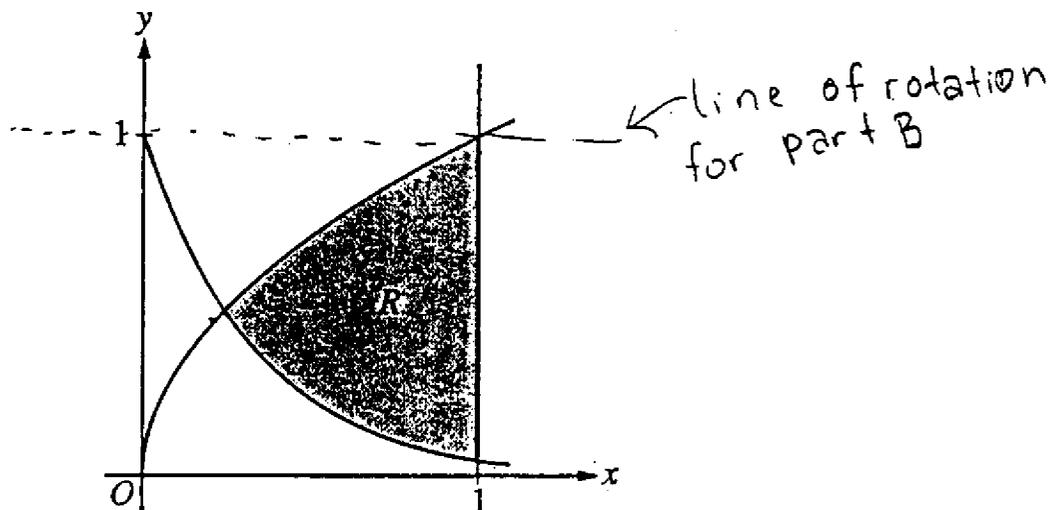
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CALCULUS BC
SECTION II, Part A
Time—45 minutes
Number of problems—3

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



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.

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Work for problem 1(b)

$$\text{Volume of solid} = \pi \int_{.239}^1 R^2 - r^2 dx$$

$$R = 1 - e^{-3x} \quad r = 1 - \sqrt{x}$$

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

$$V = 1.424$$

Work for problem 1(c)

$$V = \int_{.239}^1 h \cdot b dx$$

$$h = 5b \quad b = \sqrt{x} - e^{-3x}$$

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

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

$$V = 1.554$$

GO ON TO THE NEXT PAGE.

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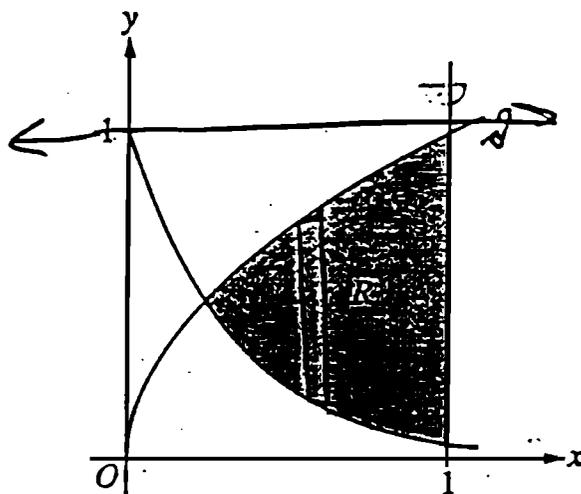
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CALCULUS AB
SECTION II, Part A

Time—45 minutes

Number of problems—3

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



Work for problem 1(a)

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

Finding
bound
 $x^{1/2} = e^{-3x}$
 $x \approx .24$

Continue problem 1 on page 5.

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)

$\sqrt{x} - e^{-3x} = \text{length of base}$
 $5(\sqrt{x} - e^{-3x}) = \text{height}$
 Area of Rec = base \times height
 $A = 5(\sqrt{x} - e^{-3x})^2$

To find Volume, integrate the area - use disc method

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