AP® Calculus AB
2002 Sample Student Responses

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CALCULUS AB

SECTION II, Part A

Time—45 minutes

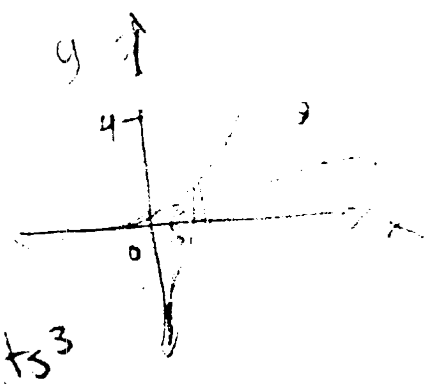
Number of problems—3

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

Work for problem 1(a)

$\int_{.5}^{1} (e^x - \ln x)\,dx = 1.223$ units^2

A2



Work for problem 1(b)

$R = 4 - \ln x$

$r = 4 - e^x$

$\pi \int_{.5}^{1} \left((4 - \ln(x))^2 - (4 - e^x)^2 \right) dx = 23.609$ units^3

Work for problem 1(c)

$h(x) = f(x) - g(x)$

$= e^x - \ln x$

$h'(x) = e^x - \frac{1}{x}$

For criticals

$e^x - \frac{1}{x} = 0$

$\ln e^x = \ln \frac{1}{x}$

$x = \ln \frac{1}{x}$

$x = -\ln x$

$\ln x + x = 0$

$x = .567$

End pts: .5, 1

x	$f(x)$
.5	2.341
.567	2.330
1	2.718

To determine the absolute minimum and maximum I found any criticals (when h'(x) equals 0) and the end points. There was only one critical number, which occurred at x = .567. When I compared the values of each number (see chart), I found the absolute minimum value to be 2.330 and the absolute maximum value to be 2.718 (or e).

GO ON TO THE NEXT PAGE.

C1

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)

$A = \int_{\frac{1}{2}}^{1} e^x - \ln x \, dx = \boxed{1.223} \; u^2$

(using fnInt)

C2

Work for problem 1(b)

$$V = \pi\int_{\frac{1}{2}}^{1} (4-\ln x)^2-(4-e^x)^2\,dx = \boxed{23.610}\ u^3$$

(using fnInt)

Work for problem 1(c)

$h'(x) = f'(x) - g'(x)$

$h'(x) = e^x - \frac{1}{x} = 0$

$h(1) = \boxed{e - \ln 1} = MAX$

e^x grows faster than $\ln x$ so on the interval $\frac{1}{2} \le x \le 1$, the greatest value of $h(x)$ will be at $x=1$.

$h(\frac{1}{2}) = \boxed{e^{\frac{1}{2}} - \ln \frac{1}{2}} = MIN$

since e^x grows faster than $\ln x$ the min. value will be at the very beginning of the interval at $x=\frac{1}{2}$.