AP® Calculus BC
2002 Sample Student Responses

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CALCULUS

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

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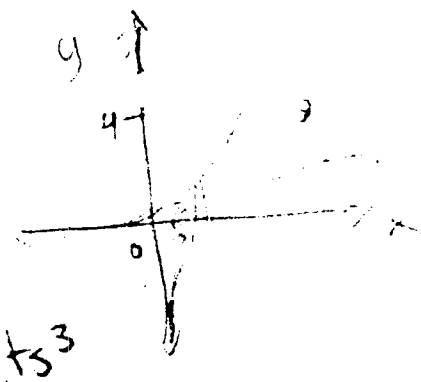
Work for problem 1(b)

$R = 4 - \ln x$

$r = 4 - e^x$



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

Work for problem 1(c)

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

$= e^x - \ln x$

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

For criticals

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

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

$x = \ln(x^{-1})$

$x = -\ln x$

$\ln x + x = 0$

$x = .567$

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).

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CALCULUS

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)

1 [redacted] 1 [redacted] 1 [redacted] 1 [redacted] 1 [redacted] 1

C_2

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 $x = 1$.

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

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