



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)

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

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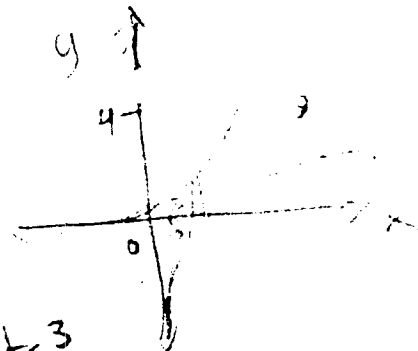
A₂

Work for problem 1(b)

$$R = 4 - \ln x$$

$$r = 4 - e^x$$

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



Work for problem 1(c)

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

$$= e^x - \ln x$$

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

For criticals

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

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

$$x = \ln(x)$$

$$x = -\ln x$$

$$\ln x + x = 0$$

$$x = .567$$

Endpts: .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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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)

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C2

Work for problem 1(b)

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

(using fnInt)

Work for problem 1(c)

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

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

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

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

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

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