Math 1b. Reviewing the Definite Integral

Spring 2006

1. Which of the following are equal to

$$\int_1^5 \frac{\ln x}{x}\,dx?$$

Please circle all of the correct answers. You do not need to justify your solution.

(a) $\displaystyle\sum_{i=1}^{5} \frac{\ln x_i}{x_i}\Delta x$, where $\Delta x = 4/n$ and $x_i = 1 + i\Delta x_i$.

(b) $\displaystyle\lim_{n\to\infty} \sum_{i=1}^{5} \frac{\ln x_i}{x_i}\Delta x$, where $\Delta x = 4/n$ and $x_i = 1 + i\Delta x_i$.

(c) $\displaystyle\lim_{n\to\infty} \sum_{i=1}^{n} \frac{\ln x_i}{x_i}\Delta x$, where $\Delta x = 4/n$ and $x_i = 1 + i\Delta x_i$.

(d) $(\ln 5)^2/2$

(e) $\displaystyle\frac{1}{2}\left(\frac{\ln 5}{5}\right)^2 - \frac{1}{2}(\ln 1)^2$

(f) $\displaystyle\frac{1}{5^2} - \frac{1}{1^2}$

(g) $\ln(\ln(5)) - \ln(\ln 1))$

(h) $\displaystyle\frac{\ln 1}{1} + \frac{\ln 2}{2} + \frac{\ln 3}{3} + \frac{\ln 4}{4}$

2. Put the following in *ascending* order (with "=" or "<" signs between each expression. You do not need to justify your solution. [*Hint*: Think about which expressions are positive, which are negative, and which are zero. A picture may be helpful.]

   (a) $\displaystyle\int_2^6 \ln t \, dt$

   (b) $\ln 2 + \ln 3 + \ln 4 + \ln 5$

   (c) $\ln 3 + \ln 4 + \ln 5 + \ln 6$

   (d) zero

   (e) $\ln(2/6)$

   (f) $\displaystyle\lim_{h \to 0} \frac{\ln(2+h) - \ln 2}{h}$