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**Quiz – March 4, 2004**

Find

$$\int_1^e \frac{dx}{x \ln x}.$$

**Answer:** The function  $\frac{1}{x \ln x}$  is continuous for all positive  $x$  except  $x = 1$ ; so

$$\begin{aligned} \int_1^e \frac{dx}{x \ln x} &= \lim_{a \rightarrow 1^+} \int_a^e \frac{dx}{x \ln x} = \lim_{a \rightarrow 1^+} \ln |\ln x| \Big|_a^e = \lim_{a \rightarrow 1^+} (\ln |\ln e| - \ln |\ln a|) \\ &= \ln(1) - (-\infty) = 0 + \infty. \end{aligned}$$

This integral diverges to  $+\infty$ .