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Exercise for September 10, 2005

X is a random variable uniformly distributed on the interval $[1, 2]$. Find the probability density function of $Y = \ln X$.

- A. $\frac{1}{\ln 2}$ B. $\ln 2$ C. $\ln y$ D. $\frac{e^y}{y}$ E. e^y

Solution.

First note that $f_X(x) = 1$ for $1 \leq x \leq 2$. We have $Y = \ln X$ so that $X = e^Y$ and

$$\frac{dX}{dY} = e^Y = X.$$

Therefore

$$f_Y(y) = f_X(x(y)) \cdot \left| \frac{dx}{dy} \right| = 1 \cdot e^y = e^y,$$

where $0 \leq y \leq \ln 2$.

Answer E.

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