

STEP II, 2007, Q14

14 The random variable X has a continuous probability density function $f(x)$ given by

$$f(x) = \begin{cases} 0 & \text{for } x \leq 1 \\ \ln x & \text{for } 1 \leq x \leq k \\ \ln k & \text{for } k \leq x \leq 2k \\ a - bx & \text{for } 2k \leq x \leq 4k \\ 0 & \text{for } x \geq 4k \end{cases}$$

where k , a and b are constants.

- (i) Sketch the graph of $y = f(x)$.
- (ii) Determine a and b in terms of k and find the numerical values of k , a and b .
- (iii) Find the median value of X .



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