

STEP III, 2017, Q13

- 13** The random variable X has mean μ and variance σ^2 , and the function V is defined, for $-\infty < x < \infty$, by

$$V(x) = E((X - x)^2).$$

Express $V(x)$ in terms of x , μ and σ .

The random variable Y is defined by $Y = V(X)$. Show that

$$E(Y) = 2\sigma^2. \quad (*)$$

Now suppose that X is uniformly distributed on the interval $0 \leq x \leq 1$. Find $V(x)$. Find also the probability density function of Y and use it to verify that $(*)$ holds in this case.



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