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7. The continuous random variable X has probability density function

$$f(x) = \begin{cases} c(x+3) & -3 \leqslant x < 0 \\ \frac{5}{36}(3-x) & 0 \leqslant x \leqslant 3 \\ 0 & \text{otherwise} \end{cases}$$

where c is a positive constant.

(a) Show that $c = \frac{1}{12}$

(3)

(b) (i) Sketch the probability density function.

(ii) Explain why the mode of $X = 0$

(3)

(c) Find the cumulative distribution function of X, for all values of x

(4)

(d) Find, to 3 significant figures, the value of d such that $P(X > d \mid X > 0) = \frac{2}{5}$

(4)

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