1. The continuous random variable X has cumulative distribution function given by

$$\mathrm{F}(x) = \begin{cases} 0 & x < 0 \\ k\left(6x^2 - x^4\right) & 0 \leqslant x \leqslant 1 \\ 1 & x > 1 \end{cases}$$

where k is a positive constant.

(a) Show that $k = \frac{1}{5}$

(1)

(b) Find $\mathrm{P}(X > 0.6)$

(2)

(c) (i) Show that the median, m, of X satisfies

$$am^4 + bm^2 + c = 0$$

where a, b and c are integers to be found.

(ii) Hence, find the value of m

(3)

(d) Find, using calculus, the mode of X

(3)

Given that $\mathrm{E}(X) = 0.64$

(e) state, giving a reason, the skewness of the distribution.

(2)

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Question 1 continued

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Question 1 continued

(Total for Question 1 is 11 marks)