2. A continuous random variable X has cumulative distribution function

$$F(x) = \begin{cases} 0 & x < 4 \\ k(x-4) & 4 \leqslant x \leqslant 10 \\ 1 & x > 10 \end{cases}$$

where k is a constant.

(a) Show that $k = \frac{1}{6}$

(1)

(b) Write down the value of $P(X = 5)$

(1)

(c) Find $P(5 < X < 7)$

(2)

(d) Specify the probability density function of X, for all values of x

(2)

(e) Hence sketch the probability density function of X

(2)

(f) Write down the value of $E(X)$

(1)

(g) Find $E(2X^2 - 1)$
You must make your method clear.

(3)

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Question 2 continued

(Total for Question 2 is 12 marks)