6. The continuous random variable Y has cumulative distribution function given by

$$\mathrm{F}(y) = \begin{cases} 0 & y < 0 \\ \frac{1}{21}y^2 & 0 \leqslant y \leqslant k \\ \frac{2}{15}\left(6y - \frac{y^2}{2}\right) - \frac{7}{5} & k < y \leqslant 6 \\ 1 & y > 6 \end{cases}$$

(a) Find $\mathrm{P}\left(Y < \frac{1}{4}k \,|\, Y < k\right)$

(2)

(b) Find the value of k

(4)

(c) Use algebraic calculus to find $\mathrm{E}(Y)$

(6)

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Question 6 continued

(Total for Question 6 is 12 marks)