6. The continuous random variable X has probability density function

$$f(x) = \begin{cases} 0.1x & 0 \leqslant x < 2 \\ kx(8 - x) & 2 \leqslant x < 4 \\ a & 4 \leqslant x < 6 \\ 0 & \text{otherwise} \end{cases}$$

where k and a are constants.

It is known that $P(X < 4) = \frac{31}{45}$

(a) Find the exact value of k

(4)

(b) (i) Find the exact value of a

(ii) Find the exact value of $P(0 \leqslant X \leqslant 5.5)$

(3)

(c) Specify fully the cumulative distribution function of X

(6)

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