

The continuous random variable  $X$  has probability density function  $f$  given by

$$f(x) = \begin{cases} a + \frac{1}{5}x & 0 \leq x < 1, \\ 2a - \frac{1}{5}x & 1 \leq x \leq 2, \\ 0 & \text{otherwise,} \end{cases}$$

where  $a$  is a constant.

**(a)** Find the value of  $a$ . [3]

**(b)** Find  $E(X^2)$ . [2]

**(c)** Find the cumulative distribution function of  $X$ . [3]