



As shown in the diagram, the continuous random variable  $X$  has probability density function  $f$  given by

$$f(x) = \begin{cases} mx & 0 \leq x \leq 2, \\ \frac{k}{x^2} + c & 2 \leq x \leq 6, \\ 0 & \text{otherwise,} \end{cases}$$

where  $m$ ,  $k$  and  $c$  are constants.

**(a)** Given that  $P(X \leq 2) = \frac{1}{3}$ , show that  $m = \frac{1}{6}$  and find the values of  $k$  and  $c$ . [4]

**(b)** Find the exact numerical value of the interquartile range of  $X$ . [5]