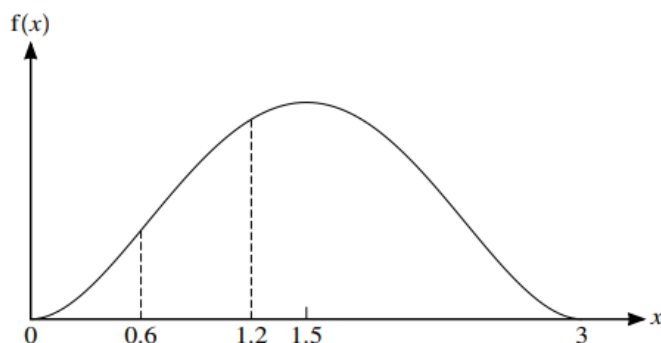


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3



The diagram shows the graph of the probability density function, f , of a random variable X that takes values between $x = 0$ and $x = 3$ only. The graph is symmetrical about the line $x = 1.5$.

- (a) It is given that $P(X < 0.6) = a$ and $P(0.6 < X < 1.2) = b$.

Find $P(0.6 < X < 1.8)$ in terms of a and b .

[2]

- (b) It is now given that the equation of the probability density function of X is

$$f(x) = \begin{cases} kx^2(3-x)^2 & 0 \leq x \leq 3, \\ 0 & \text{otherwise,} \end{cases}$$

where k is a constant.

- (i) Show that $k = \frac{10}{81}$.

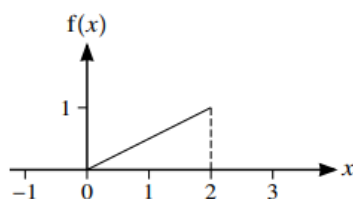
[3]

- (ii) Find $\text{Var}(X)$.

[3]

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2 (a)

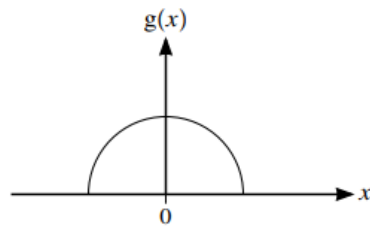


The graph of the function f is a straight line segment from $(0, 0)$ to $(2, 1)$.

Show that f could be a probability density function.

[2]

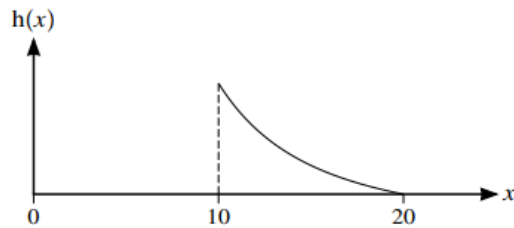
(b)



The graph of the function g is a semicircle, centre $(0, 0)$, entirely above the x -axis.

Given that g is a probability density function, find the radius of the semicircle. [2]

(c)



The time, X minutes, taken by a large number of students to complete a test has probability density function h , as shown in the diagram.

(i) Without calculation, use the diagram to explain how you can tell that the median time is less than 15 minutes. [1]

It is now given that

$$h(x) = \begin{cases} \frac{40}{x^2} - \frac{1}{10} & 10 \leq x \leq 20, \\ 0 & \text{otherwise.} \end{cases}$$

(ii) Find the mean time. [3]

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