3. The continuous random variable X has probability density function given by

$$f(x) = \begin{cases} \frac{1}{48}\left(x^2 - 8x + c\right) & 2 \leqslant x \leqslant 5 \\ 0 & \text{otherwise} \end{cases}$$

(a) Show that $c = 31$

(3)

(b) Find $P(2 < X < 3)$

(2)

(c) State whether the lower quartile of X is less than 3, equal to 3 or greater than 3
Give a reason for your answer.

(1)

Kei does the following to work out the mode of X

$$f'(x) = \frac{1}{48}(2x - 8)$$

$$0 = \frac{1}{48}(2x - 8)$$

$$x = 4$$

Hence the mode of X is 4

Kei's answer for the mode is incorrect.

(d) Explain why Kei's method does not give the correct value for the mode.

(1)

(e) Find the mode of X
Give a reason for your answer.

(2)

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

Question 3 continued

Question 3 continued

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA

DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA
DO NOT WRITE IN THIS AREA

Question 3 continued

(Total for Question 3 is 9 marks)