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7. Jonathan believes that the time, in minutes, people spend queuing for lunch at a particular fast food restaurant can be modelled using the continuous random variable X, which has cumulative distribution function

$$F(x) = \begin{cases} 0 & x < 0 \\ \frac{1}{3125}(25x^4 - 4x^5) & 0 \leqslant x \leqslant 5 \\ 1 & x > 5 \end{cases}$$

(a) Find the mode of X.

(4)

(b) Show that the upper quartile of X is 4.0 to one decimal place.

(3)

Olivia believes that this model overestimates the proportion of queuing times that are more than 4.0 minutes. She takes a random sample of 25 queuing times and finds that 3 of them are more than 4.0 minutes.

Assuming that the model gives a probability of 0.25 that the queuing time is more than 4.0 minutes,

(c) use a suitable test, at the 5% level of significance, to assess Olivia's belief. State your hypotheses clearly.

(5)

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Q7

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