5. A continuous random variable Y has cumulative distribution function given by

$$\mathrm{F}(y) = \begin{cases} 0 & y < 3 \\ \frac{1}{16}\left(y^2 - 6y + a\right) & 3 \leqslant y \leqslant 5 \\ \frac{1}{12}\left(y + b\right) & 5 < y \leqslant 9 \\ \frac{1}{12}\left(100y - 5y^2 + c\right) & 9 < y \leqslant 10 \\ 1 & y > 10 \end{cases}$$

where a, b and c are constants.

(a) Find the value of a and the value of c

(4)

(b) Find the value of b

(2)

(c) Find $\mathrm{P}(6 < Y \leqslant 9)$
Show your working clearly.

(3)

(d) Specify the probability density function, $\mathrm{f}(y)$, for $5 < y \leqslant 9$

(1)

Using the information

$$\int_3^5 (6y - 5)\,\mathrm{f}(y)\,\mathrm{d}y + \int_9^{10} (6y - 5)\,\mathrm{f}(y)\,\mathrm{d}y = 26.5$$

(e) find $\mathrm{E}(6Y - 5)$
You should make your method clear.

(4)

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