| Question Number | Scheme | Marks |
|---|---|---|
| **7(a)** | $1 \leqslant x < 2$: | |
| | $\int \frac{3}{4}(x-1)\,dx = \frac{3x^2}{8} - \frac{3x}{4}$ $[+c]$ $\left[\text{OR } \ldots = \frac{3}{8}(x-1)^2\,[+c]\right]$ | M1 |
| | F(1) = 0 $\Rightarrow$ $c = \frac{3}{8}$ [OR …. $[c=0]$ | dM1 |
| | $2 \leqslant x \leqslant 4$: | |
| | $\int \frac{3}{32}x(x-4)^2\,dx = \frac{3x^4}{128} - \frac{x^3}{4} + \frac{3x^2}{4}$ $[+k]$ | M1 |
| | F(4) = 1 or F(2) $= \frac{3}{8}$ $\Rightarrow$ $k = -1$ | dM1 |
| | $F(x) = \begin{cases} 0 & x < 1 \\ \frac{3x^2}{8} - \frac{3x}{4} + \frac{3}{8} \text{ o.e. e.g. } \frac{3}{8}(x-1)^2 & 1 \leqslant x < 2 \\ \frac{3x^4}{128} - \frac{x^3}{4} + \frac{3x^2}{4} - 1 \text{ o.e. e.g. } \frac{(x-4)^3(3x+4)}{128} + 1 & 2 \leqslant x \leqslant 4 \\ 1 & x > 4 \end{cases}$ | A1<br>A1<br>A1<br>(7) |
| **(b)** | F($m$) = 0.5<br>F(2.165) = 0.493…<br>F(2.175) = 0.5001…<br>$\Rightarrow$ F(2.165) < 0.5< F(2.175) $\therefore m = 2.17$ (2 dp) | M1<br>A1<br>(2) |
| | Notes | **Total 9** |
| **(a)** M1 | for attempted integration of 1st part (at least one $x^n \to x^{n+1}$) | |
| dM1 | (dependent on 1st M1) for $\int \frac{3}{4}(x-1)\,dx$ and use of F(1) = 0 | |
| | or for $\int_1^m \frac{3}{4}(x-1)\,dx$ with both limits substituted. Implied by correct function | |
| M1 | simplifying 2nd part $\left[\frac{3}{32}\left(x^3 - 8x^2 + 16x\right)\right]$ (3 terms at least 2 correct) oe condone missing 3/32 and integrating (at least one correct) or 1st stage of integration by parts correct | |
| dM1 | (dependent on 3rd M1) $\int \frac{3}{32}x(x-4)^2\,dx$ and using F(4) =1 or F(2) $= \frac{3}{8}$ (need to see subst of 4 or 2) or $\int_2^m \frac{3}{32}x(x-4)^2\,dx$ + their F(2). Do not allow it written as F(2) rather than a value. For both these F(2) may be incorrect but the substitution of 2 into cdf part 1 must be seen. Implied by correct function. | |
| A1 | fully correct 1st part of F($x$). | |
| A1 | fully correct 2nd part of F($x$) | |
| A1 | (dependent on at least one M1) for F($x$) defined for $x < 1$ and $x > 4$ allow "otherwise" for one<br>NB Allow $\leqslant$ for < signs and vice versa and $\geqslant$ for > | |
| **(b)** M1 | For use of F(m) = 0.5 and using 2 appropriate bounds from $(2.165 \leqslant m \leqslant 2.175 : m \neq 2.17)$ into their 2nd part of F($x$) for $2 \leqslant x \leqslant 4$ or "their line for $2 \leqslant x \leqslant 4$" – 0.5<br>Or median = 2.17471… 4 dp or better | |
| A1 | Appropriate reason for their method. eg F(2.165) < 0.5 < F(2.175) or change in sign leading to conclusion that $m$ = 2.17 or if value of median found "therefore median = 2.17 to 2 dp" | |

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