Question Number	Scheme		Marks
6(a)	$\mathrm{E}(X^2)=\int_{-1}^{1}\frac{1}{8}\left(x^4+2x^3+x^2\right)\mathrm{d}x+\int_{1}^{\frac{11}{3}}\frac{1}{4}x^2\mathrm{d}x$		M1
	$=\left[\frac{1}{8}\left(\frac{x^5}{5}+\frac{2x^4}{4}+\frac{x^3}{3}\right)\right]_{-1}^{1}+\left[\frac{x^3}{12}\right]_{1}^{\frac{11}{3}}$		A1
	$=\frac{1684}{405}$		
	$\mathrm{Var}(X)=\text{"}\frac{1684}{405}\text{"}-\left(\frac{31}{18}\right)^2$		dM1
	$=\frac{1931}{1620}$ or 1.1919…	awrt **1.19**	A1
			(4)
(b)	$\mathrm{P}\left(X<-\frac{1}{2}\right)=\int_{-1}^{-0.5}\frac{1}{8}\left(x^2+2x+1\right)\mathrm{d}x$ **or** $1-\int_{-0.5}^{0.5}\frac{1}{8}\left(x^2+2x+1\right)\mathrm{d}x$ (gets M2)		M1
	$\mathrm{P}\left(X>\frac{1}{2}\right)=\frac{2}{3}+\int_{0.5}^{1}\frac{1}{8}\left(x^2+2x+1\right)\mathrm{d}x$		M1
	$\mathrm{P}\left(X<-\frac{1}{2}\right)=\left[\frac{x^3}{24}+\frac{x^2}{8}+\frac{x}{8}\right]_{-1}^{-0.5}$ **or** $\mathrm{P}\left(X>\frac{1}{2}\right)=\frac{2}{3}+\left[\frac{x^3}{24}+\frac{x^2}{8}+\frac{x}{8}\right]_{0.5}^{1}$ **or** $1-\left[\frac{x^3}{24}+\frac{x^2}{8}+\frac{x}{8}\right]_{-0.5}^{0.5}$		A1
	$=\frac{83}{96}$ or 0.8645…	awrt **0.865**	A1
			(4)
			Total 8

Notes

In parts (a) and (b) a correct answer does NOT imply all marks.

(a)

M1 For attempt at $\int x^2\mathrm{f}(x)\mathrm{d}x$ for both parts of f(x) added **and** attempt to integrate $x^n \to x^{n+1}$

A1 Correct algebraic integration (ignore limits). This mark cannot be implied.

dM1 dep on previous M1 for "an expression for their E(X^2)" – [E(X)]^2
Values must be substituted here

A1 awrt 1.19

(b)

	Main scheme method	Alternative method using F(x)
M1	$\int_{-1}^{-0.5}\frac{1}{8}\left(x^2+2x+1\right)\mathrm{d}x$ oe	$\int_{-1}^{x}\frac{1}{8}\left(t^2+2t+1\right)\mathrm{d}t$ or $\int\frac{1}{8}\left(x^2+2x+1\right)\mathrm{d}x$ with + C
M1	$\frac{2}{3}+\int_{0.5}^{1}\frac{1}{8}\left(x^2+2x+1\right)\mathrm{d}x$ oe	Use of F(–0.5) + (1 – F(0.5)) oe
NB	$1-\int_{-0.5}^{0.5}\frac{1}{8}\left(x^2+2x+1\right)\mathrm{d}x$ gets M2	**Note:** $\mathrm{F}(-0.5)=\frac{1}{192}$ and $\mathrm{F}(0.5)=\frac{9}{64}$
A1	One correct integration (may be implied by $\frac{1}{192}$, $\frac{9}{64}$ or $\frac{55}{64}$)	$\mathrm{F}(x)=\frac{1}{8}\left(\frac{x^3}{3}+x^2+x+\frac{1}{3}\right)$ (from $-1<x<1$)

A1 $\frac{83}{96}$ or awrt 0.865 must come from correct working and dependent on all previous marks.

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