Question Number	Scheme	Marks
1	$(8+32x)^{\frac{1}{3}} = 8^{\frac{1}{3}}(1+4x)^{\frac{1}{3}}$	B1
	$(1+4x)^{\frac{1}{3}} = 1+\left(\frac{1}{3}\right)(4x)+\frac{\frac{1}{3}\left(\frac{1}{3}-1\right)}{2!}(4x)^2+\frac{\frac{1}{3}\left(\frac{1}{3}-1\right)\left(\frac{1}{3}-2\right)}{3!}(4x)^3+\ldots$	M1A1
	$(8+32x)^{\frac{1}{3}} = 2+\frac{8}{3}x-\frac{32}{9}x^2+\frac{640}{81}x^3+\ldots$	A1
		(4)
		Total 4

Notes

B1: For taking out a factor of $8^{\frac{1}{3}}$ or e.g. 2 to obtain e.g. $8^{\frac{1}{3}}(1+\ldots)$. Seen anywhere in their work

M1: Correct attempt at the 3rd or 4th term of a binomial expansion of $(1\pm ax)^{\frac{1}{3}}$

Look for $\frac{\frac{1}{3}\left(\frac{1}{3}-1\right)}{2}(\pm ax)^2$ or $\frac{\frac{1}{3}\left(\frac{1}{3}-1\right)\left(\frac{1}{3}-2\right)}{3!}(\pm ax)^3$ where *a* could be 1

For this mark we are looking for the correct binomial coefficient paired with the correct power of *x*

A1: Correct unsimplified (or simplified) expansion of the **bracket** e.g.:

$$(1+4x)^{\frac{1}{3}} = 1+\left(\frac{1}{3}\right)(4x)+\frac{\frac{1}{3}\left(\frac{1}{3}-1\right)}{2!}(4x)^2+\frac{\frac{1}{3}\left(\frac{1}{3}-1\right)\left(\frac{1}{3}-2\right)}{3!}(4x)^3+\ldots$$

NB simplified is: $1+\frac{4}{3}x-\frac{16}{9}x^2+\frac{320}{81}x^3+\ldots$

or for 2 correct simplified terms for the final expansion from $\frac{8}{3}x-\frac{32}{9}x^2+\frac{640}{81}x^3$

A1cao: $2+\frac{8}{3}x-\frac{32}{9}x^2+\frac{640}{81}x^3+\ldots$

All coefficients must be simplified, accept as a list and ignore any extra terms

Alternative by direct expansion:

$$(8+32x)^{\frac{1}{3}} = 8^{\frac{1}{3}}+\frac{1}{3}\left(8^{-\frac{2}{3}}\right)(32x)+\frac{\frac{1}{3}\left(-\frac{2}{3}\right)}{2}\left(8^{-\frac{5}{3}}\right)(32x)^2+\frac{\frac{1}{3}\left(-\frac{2}{3}\right)\left(-\frac{5}{3}\right)}{6}\left(8^{-\frac{8}{3}}\right)(32x)^3+\ldots$$

B1: For $8^{\frac{1}{3}}$ or 2 seen as the constant term.

M1: For the correct term 3 or term 4 of the expansion.

A1: For two correct and simplified terms.

A1: Correct expansion from correct work. Accept as a list and ignore any extra terms.

NOTE: Isw any further 'simplification' once the correct response has been seen.

Question Number	Scheme	Marks
2(a)	$\dfrac{2x^2-x+11}{(x+2)(2x-3)}=1+\dfrac{-2x+17}{(x+2)(2x-3)}$	M1A1
	$\dfrac{-2x+17}{(x+2)(2x-3)}=\dfrac{B}{x+2}+\dfrac{C}{2x-3}\Rightarrow B=...,\ C=...$	M1
	$\dfrac{2x^2-x+11}{(x+2)(2x-3)}=1-\dfrac{3}{x+2}+\dfrac{4}{2x-3}$	A1
	ALT 1	
	$2x^2-x+11=A(x+2)(2x-3)+B(2x-3)+C(x+2)$ Let e.g., $x=-2$ or $x=\dfrac{3}{2}$ $\Rightarrow$ eliminates either B or $C\Rightarrow B=-3$ or $C=4$	M1A1
	$2x^2-x+11=A(x+2)(2x-3)+B(2x-3)+C(x+2)$ Let e.g., $x=-2$ and $x=\dfrac{3}{2}\Rightarrow$ finds B,C and A	M1
	$\dfrac{2x^2-x+11}{(x+2)(2x-3)}=1-\dfrac{3}{x+2}+\dfrac{4}{2x-3}$	A1
	ALT 2	
	$2x^2-x+11=2Ax^2+x(A+2B+C)+(-6A-3B+2C)$ $\Rightarrow$ equates coefficients to find $A\Rightarrow 2=2A\Rightarrow A=1$	M1A1
	$A+2B+C=-1\Rightarrow 1+2B+C=-1$ $-6A-3B+2C=11\Rightarrow -6-3B+2C=11$ $\Rightarrow B=.....,\quad C=.....$	M1
	$\dfrac{2x^2-x+11}{(x+2)(2x-3)}=1-\dfrac{3}{x+2}+\dfrac{4}{2x-3}$	A1
		(4)
(b)	$\displaystyle\int\left(1-\frac{3}{x+2}+\frac{4}{2x-3}\right)\mathrm{d}x=x-3\ln\lvert x+2\rvert+2\ln\lvert 2x-3\rvert(+c)$	M1A1ftA1ft
		(3)
		Total 7

Notes

(a)

M1: Uses e.g. long division or inspection to express $f(x)$ as a constant with a linear remainder of the form $1+\dfrac{\pm\alpha x\pm\beta}{(x+2)(2x-3)}$ where α,β are non zero constants.

A1: Correct expression. i.e., $1+\dfrac{-2x+17}{(x+2)(2x-3)}\Rightarrow A=1$