Question Number	Scheme	Marks
7 (a)	$\left(1+\frac{x}{3}\right)^{\frac{1}{4}} = 1+\frac{1}{4}\times\frac{x}{3}+\frac{\frac{1}{4}\times\left(-\frac{3}{4}\right)}{2!}\left(\frac{x}{3}\right)^2+\frac{\frac{1}{4}\times\left(-\frac{3}{4}\right)\left(-\frac{7}{4}\right)}{3!}\left(\frac{x}{3}\right)^3$	M1
	$=1+\frac{x}{12}-\frac{x^2}{96}+\frac{7}{3456}x^3$ oe for each coeff	A2 (-1 ee)
		(3)
(b)	$\left(1-\frac{x}{3}\right)^{-\frac{1}{4}} = 1+\left(-\frac{1}{4}\right)\times\left(-\frac{x}{3}\right)+\frac{\left(-\frac{1}{4}\right)\times\left(-\frac{5}{4}\right)}{2!}\left(-\frac{x}{3}\right)^2+\frac{\left(-\frac{1}{4}\right)\times\left(-\frac{5}{4}\right)\left(-\frac{9}{4}\right)}{3!}\left(-\frac{x}{3}\right)^3$	M1
	$=1+\frac{x}{12}+\frac{5}{288}x^2+\frac{5}{1152}x^3$ oe for each coeff	A2 (-1 ee)
		(3)
(c)	$\lvert x\rvert < 3$	B1
		(1)
(d)	$\left(\frac{3+x}{3-x}\right)^{\frac{1}{4}} = \left(\frac{1+\frac{x}{3}}{1-\frac{x}{3}}\right)^{\frac{1}{4}} = \left(1+\frac{x}{3}\right)^{\frac{1}{4}}\times\left(1-\frac{x}{3}\right)^{-\frac{1}{4}}$	M1
	$=\left(1+\frac{x}{12}-\frac{x^2}{96}+\frac{7}{3456}x^3\right)\times\left(1+\frac{x}{12}+\frac{5}{288}x^2+\frac{5}{1152}x^3\right)$	
	$=1+\frac{x}{12}+\frac{5}{288}x^2+\frac{x}{12}+\frac{x^2}{144}-\frac{x^2}{96}$	M1
	$=1+\frac{x}{6}+\frac{x^2}{72}$ oe for each coeff	A1
		(3)

(e)	$\int_0^{0.6}\left(\frac{3+x}{3-x}\right)\mathrm{d}x = \int_0^{0.6}\left(1+\frac{x}{6}+\frac{x^2}{72}\right)\mathrm{d}x$	M1
	$=\left[x+\frac{x^2}{12}+\frac{x^3}{216}\right]_0^{0.6}$	A1
	$=0.6+\frac{0.6^2}{12}+\frac{0.6^3}{216}-0$	M1d
	$=0.631$	A1 (4) **[14]**

Notes

(a)

M1 for using a correct binomial expansion at least up to the term in x^2. If there are errors in substitution, withhold this mark if the formula is not seen. Each term, must have at least, the correct power of $\frac{x}{3}$. The expansion must start with 1.

A1 for 1 + the term in x correct, and either term in x^2 **or** x^3 correct, need not be simplified.

A1 for the expansion correct as shown above. Accept equivalent fractions.

(b)

M1 for using a correct binomial expansion at least up to the term in x^2. If there are errors in substitution, withhold this mark if the formula is not seen. Each term, must have at least, the correct power of $\frac{x}{3}$. The expansion must start with 1.

A1 for 1 + the term in x correct, and either term in x^2 **or** x^3 correct, need not be simplified.

A1 for the expansion fully correct as shown above. Accept equivalent fractions.

(c)

B1 for $-3 < x < 3$ or $|x| < 3$

(d)

M1 for setting $\left(\frac{3+x}{3-x}\right)^{\frac{1}{4}} = \left(1+\frac{x}{3}\right)^{\frac{1}{4}} \times \left(1-\frac{x}{3}\right)^{-\frac{1}{4}}$ or their (a) × their (b)

{only need terms as far as x^2 } If there is a 3 or a 9 present, M0

M1 for multiplying out their (a) × (b). (Ignore the presence of a 3 or a 9 for this mark) Check that they have multiplied out fully. There are six terms in total up to and including terms in x^2.

A1 for the answer as shown (oe)

(e)

M1 for using their answer in part (d) to form an integral of a quadratic expression. Ignore limits and condone a missing dx.

A1 for a correct integration (no ft)

M1d for correct substitution of 0.6. Allow missing 0

A1 0.631 cso

If 0.631 is seen without working, **no marks** in part (e). (Not 'hence obtain....')