Question Number	Scheme	Marks
1 (a)	$(1+kx)^{\frac{1}{2}} = 1+\left(\frac{1}{2}\right)\times(kx)+\frac{\left(\frac{1}{2}\right)\times\left(-\frac{1}{2}\right)}{2!}\times(kx)^2+\frac{\left(\frac{1}{2}\right)\times\left(-\frac{1}{2}\right)\times\left(-\frac{3}{2}\right)}{3!}\times(kx)^3\ldots$	
(i)	$\frac{1}{2}k=\frac{1}{8}\Rightarrow k=\frac{1}{4}$	M1A1
(ii)	$A=\frac{\left(\frac{1}{2}\right)\times\left(-\frac{1}{2}\right)}{2!}\times"k"^2=-\frac{1}{128}$ $B=\frac{\left(\frac{1}{2}\right)\times\left(-\frac{1}{2}\right)\times\left(-\frac{3}{2}\right)}{3!}\times"k"^3=\frac{1}{1024}$	M1 A1 A1
		(5)
(b)	Substitutes $x=0.6\Rightarrow\sqrt{1.15}=1+\frac{1}{8}\times0.6-"\frac{1}{128}"\times0.6^2+"\frac{1}{1024}"\times0.6^3=1.072398$	M1 A1
		(2)
		(7 marks)
1(b) alt	$(1+kx)^{\frac{1}{2}}=1+\left(\frac{1}{2}\right)\times(kx)-\left(\frac{1}{8}\right)\times(kx)^2+\left(\frac{1}{16}\right)\times(kx)^3$ Substitutes $"kx"=0.15$ $\Rightarrow\sqrt{1.15}=1+\frac{1}{2}\times0.15-\frac{1}{8}\times0.15^2+\frac{1}{16}\times0.15^3=1.072398$	M1A1
		(2)

(a)(i)

M1: Sets $\frac{1}{2}k=\frac{1}{8}$ or $\frac{1}{2}kx=\frac{1}{8}x$ and proceeds to find *k.* Implied by a correct value for *k*

A1: $k=\frac{1}{4}$ oe such as $\frac{2}{8}$ or 0.25

(a)(ii)

M1: Correct attempt at 3rd **or** 4th term. Eg. $Ax^2=\frac{\left(\frac{1}{2}\right)\times\left(-\frac{1}{2}\right)}{2!}\times(kx)^2$ or $Bx^3=\frac{\left(\frac{1}{2}\right)\times\left(-\frac{1}{2}\right)\times\left(-\frac{3}{2}\right)}{3!}\times(kx)^3$ with an attempt at substituting in their value for *k* to find a value for *A* or a value for *B*. Condone a missing bracket around the kx terms so allow with *k* instead of k^2 or k^3 respectively. These may be simplified so award for $A=-\frac{1}{8}\times("k")^2$ or $B=\frac{1}{16}\times("k")^3$ again, condoning *k* instead of k^2 or k^3 respectively.

A1: $A=-\frac{1}{128}$ o.e. There is no requirement to simplify the fraction

A1: $B=\frac{1}{1024}$ o.e You may occasionally see $B=\frac{3}{3072}$ which is fine.

(b)

M1: For an attempt to substitute

- either $kx=0.15$ into an expansion of the form $1\pm p\times(kx)\pm q\times(kx)^2\pm r\times(kx)^3$
- or $x=\frac{0.15}{"k"}$ into their $1+\frac{1}{8}x+"A"x^2+"B"x^3$

A1: 1.072398 Must be to 6 decimal places.

Question Number	Scheme	Marks
2	Achieves a lower limit of 2	B1
	Attempts $\alpha\int y^2\,\mathrm{d}x = \alpha\int \frac{81}{(2x-3)^{2.5}}\mathrm{d}x = \alpha\times\frac{-27}{(2x-3)^{1.5}}$	M1, A1
	Correct attempt at volume of solid generated **under** curve $= \pi\int_{"2"}^{6} y^2\,\mathrm{d}x = \left[\frac{k}{(2x-3)^{1.5}}\right]_{"2"}^{6} = \left(\left(-\frac{27}{27}\right)-\left(-\frac{27}{1}\right)\right)$	dM1
	$\text{Volume} = 26\pi$	A1
	Correct attempt at volume of solid $= \pi\times 9^2\times(6-"2")-"26\pi"$	ddM1
	$= 298\pi$	A1
		(7 marks)

B1: Finds the lower limit. This may be awarded anywhere. Accept on the diagram or in the limits of an integral

M1: Integrates an expression of the form $\int \frac{\ldots}{(2x-3)^{2.5}}\mathrm{d}x$ and achieves $\frac{\ldots}{(2x-3)^{1.5}}$ oe

A1: Correct integration of $\alpha\int y^2\,\mathrm{d}x = \alpha\int \frac{81}{(2x-3)^{2.5}}\mathrm{d}x$ giving a solution $\alpha\times\frac{-27}{(2x-3)^{1.5}}$ o.e.

following through on their α. Typical values of α will be 1, π or 2π. No need to simplify here

dM1: Attempts to find the volume of the solid generated by rotating the area under the curve.

Look for $\left[\frac{\ldots}{(2x-3)^{1.5}}\right]_{"2"}^{6} = \ldots$ It is dependent upon the previous M1.

The top limit must be 6 and the bottom limit must be their solution to $\frac{9}{(2x-3)^{1.25}} = 9$

A1: Correct exact volume for the solid generated by rotating the area under the curve. $\text{Volume} = 26\pi$

This may be the second part of a larger/complete expression. E.g. $\ldots. - 26\pi$

ddM1: Correct method for the volume of the solid formed by rotating the area above the curve.

Accept $\pi\times 9^2\times(6-"2")-"26\pi"$

It is dependent both previous M's

A1: 298π