Question Number	Scheme	Marks
2	Volume = $\int_{(2)}^{(8)} \frac{25\pi(x-1)}{9}(\mathrm{d}x)$ oe e.g. $\frac{25\pi}{9}\int_{(2)}^{(8)} x-1(\mathrm{d}x)$	B1
	$(\pi)\int \frac{25(x-1)}{9}\mathrm{d}x = (\pi)\frac{25(x-1)^2}{18}$ or $(\pi)\left(\frac{25x^2}{18}-\frac{25x}{9}\right)$	M1A1
	Volume = $\left[\frac{25\pi(x-1)^2}{18}\right]_2^8 = \left(\frac{25\pi(8-1)^2}{18}-\frac{25\pi(2-1)^2}{18}\right)=\frac{200}{3}\pi$	M1A1
		(5) **(5 marks)**

B1: Correct expression for the volume ignoring limits

May see e.g. $\frac{25\pi}{9}\int x-1(\mathrm{d}x)$ or $\int \frac{25\pi x}{9}-\frac{25\pi}{9}(\mathrm{d}x)$ May be unsimplified so allow $\pi\int\left(\frac{5}{3}\sqrt{x-1}\right)^2(\mathrm{d}x)$ Condone omission of dx. It cannot be scored if they make errors before the integral expression is written. π may appear later in a correct integral or integrand. Alternatively may use substitution e.g. $u^2=x-1$ and proceeding to $\pi\int\left(\frac{50}{9}u^3\right)(\mathrm{d}u)$ oe

M1: Correct attempt at integrating $(x-1)$. Look for $A(x-1)^2$ or Bx^2-Cx where *A*, *B* and C are non zero constants (indices do not need to be processed for this mark). Do not award this mark if this is only part of a sum of integrals. If using the substitution $u^2=x-1$ then look for $u^3\to u^4$

A1: $(\pi)\frac{25(x-1)^2}{18}$ or $(\pi)\left(\frac{25x^2}{18}-\frac{25x}{9}\right)$ oe (or using the substitution $u^2=x-1\Rightarrow$ $(\pi)\frac{25}{18}u^4$ oe)

Ignore any reference to π which could even appear as 2π

M1:Uses the limits of 2 and 8 within their integrated expression of the form $...(x-1)^2$ or $...x^2-...x$ and subtracts either way round. Allow $\left[\frac{25\pi(x-1)^2}{18}\right]_2^8=(\pm)\frac{200}{3}\pi$ to score this mark but if their integration is incorrect then we must see evidence of using limits not just a final answer. May be partially evaluated which you may need to check. Ignore the absence of π

If using the substitution $u^2=x-1$ then they need to use the limits $\sqrt{7}$ and 1 on an expression of the form $...u^4$

A1: $\frac{200}{3}\pi$ or exact equivalent e.g. $66\frac{2}{3}\pi$. If they subtract the wrong way round to achieve $-\frac{200}{3}\pi$ they cannot ignore the negative sign but must subsequently state e.g. volume = $\frac{200}{3}\pi$. Ignore units.

Question Number	Scheme	Marks
3 (a)	$x=\dfrac{t+15}{t+4}\Rightarrow t=\dfrac{15-4x}{x-1}$	M1
	$y=\dfrac{5}{t+2}\Rightarrow y=\dfrac{5}{\dfrac{15-4x}{x-1}+2}$	M1
	$y=\dfrac{5(x-1)}{15-4x+2(x-1)}$	dM1
	$\mathrm{g}(x)=\dfrac{5x-5}{13-2x}\qquad 1<x,,\dfrac{15}{4}$	A1B1
		(5)
(b)	$0<\mathrm{g}(x),,\dfrac{5}{2}$	M1A1
		(2)
		(7 marks)

(a)

M1: Attempts to get *t* in terms of *x* or *t* in terms of *y*. FYI $y=\dfrac{5}{t+2}\Rightarrow t=\dfrac{5}{y}-2$

Look for an equation of the form $t=\dfrac{A+Bx}{C+Dx}$ oe or $t=\dfrac{E}{y}+F$ oe where *A*,*B*, *C*, *D*, *E*, *F* $\neq 0$

If they get *t* in terms of *x* in one and *t* in terms of *y* in the other then just look for one of the equations to be of the required forms.

M1: Substitutes their *t* in terms of *x* (or *y*) in *y* (or *x*) however poorly manipulated and proceeds to an equation linking *x* and *y*. Condone slips substituting in provided the intention is clear.

FYI: $y=\dfrac{5}{t+2}\quad x=\dfrac{\dfrac{5}{y}-2+15}{\dfrac{5}{y}-2+4}=\dfrac{\dfrac{5}{y}+13}{\dfrac{5}{y}+2}$

Rearranging both equations to get *t* in terms of *x* in one and *t* in terms of *y* in the other and then equating scores this mark. Condone $y=\ldots$ or $x=\ldots$ to be implied as long as it is clearly their *y* or *x*

dM1: Proceeds to an equation of the form $y=\dfrac{ax+b}{cx+d}$ **which may be unsimplified.**

e.g. $y=\dfrac{5(x-1)}{15-4x+2(x-1)}$. It is dependent on the previous two method marks. There should be no fractions in the numerator or denominator but brackets do not need to be multiplied out. Condone slips provided they