Question number	Scheme	Marks
2	$4-x^2 = x+2 \Rightarrow x^2+x-2=0 \Rightarrow (x-1)(x+2)=0 \Rightarrow x=1,\ -2$	M1A1
	$V=\pi\int_{-2}^{1}\left(4-x^2\right)^2\ \mathrm{d}x-\pi\int_{-2}^{1}\left(x+2\right)^2\ \mathrm{d}x$	M1
	$V=\pi\int_{-2}^{1} x^4-9x^2-4x+12\ \mathrm{d}x=\pi\left[\frac{x^5}{5}-\frac{9x^3}{3}-2x^2+12x\right]_{-2}^{1}$	M1
	$V=\pi\left\{\left(\frac{1^5}{5}-3\times1^3-2\times1^2+12\times1\right)-\left(\frac{[-2]^5}{5}-3\times[-2]^3-2\times[-2]^2+12\times[-2]\right)\right\}$	M1
	$V=\frac{153\pi}{5}-9\pi$	
	$V=\frac{108\pi}{5}$	A1
	ALT	
	$V=\pi\int_{-2}^{1}\left(4-x^2\right)^2\ \mathrm{d}x-\frac{\pi}{3}\times3^2\times3$	[M1
	$V=\pi\int_{-2}^{1}\left(16-8x^2+x^4\right)\ \mathrm{d}x-[9\pi]=\pi\left[16x-\frac{8x^3}{3}+\frac{x^5}{5}\right]_{-2}^{1}-[9\pi]$	M1
	$V=\pi\left\{\left(16\times1-\frac{8(1)^3}{3}+\frac{(1)^5}{5}\right)-\left(16\times(-2)-\frac{8(-2)^3}{3}+\frac{(-2)^5}{5}\right)\right\}-[9\pi]$	M1
	$V=\frac{153\pi}{5}-9\pi$	
	$V=\frac{108\pi}{5}$	A1]
		Total 6 marks

Mark	Notes
M1	For equating the equation of the curve and the straight line, form a 3TQ with an acceptable attempt to solve the equation to find the x coordinates of the **two** points of intersection. [See General Guidance for the definition of an attempt] This mark is awarded for a complete method.
A1	For $x = 1$ and -2
Method 1	
M1	Uses the **correct** form for the volume of rotation. Ft their x coordinates used correctly. Everything must be correct for this mark including π
M1	For an attempt to integrate their expression for the volume of rotation for either the curve or the line (or even a combined expression). Do not accept a mixture of integration and differentiation. [See general guidance for minimum requirements for integration]. Award even if their expression is not squared. Ignore the absence of π or limits for this mark.
M1	For attempting to evaluate their integrated expression (which must be a changed expression) with their limits the correct way round. Substitution must be seen. Ignore the absence of π and ft their values of x for this mark
A1	For the correct exact value of $\frac{108\pi}{5}$ or exact equivalent.
Method 2	
M1	Uses the **correct** form for the volume of rotation of the curve minus the volume of the cone. The volume of the cone is: $\frac{1}{3}\times\pi\times('1'+2)^2\times('1'-'-2')$ Ft their x coordinates for the limits and for the dimensions of the cone. Everything must be correct for this mark including π
M1	For an attempt to integrate their expression for the curve. Do not accept a mixture of integration and differentiation. [See general guidance for minimum requirements for integration]. Award even if their expression is not squared, Ignore the absence of π or limits for this mark.
M1	For attempting to evaluate their integrated expression (which must be a changed expression) with their limits the correct way round. Substitution must be seen. Ignore the absence of π and ft their values of x for this mark
A1	For the correct exact value of $\frac{108\pi}{5}$ or exact equivalent.