Question number	Scheme	Marks
9	Intersections of curve and line: $x^2-2=-2x+13$ $\quad$ $y=\left(\dfrac{y-13}{2}\right)^2-2$ $\Rightarrow x^2+2x-15=0$ $\Rightarrow (x+5)(x-3)=0$ or $\Rightarrow y^2-30y+161=0$ $\Rightarrow x=(-5),\ 3$ $\quad$ $\Rightarrow (y-7)(y-23)=0$ when $x=3, y=7$ $\quad$ $\Rightarrow y=7,\ (23)$	M1 M1 A1
	<u>Volume of cone</u> Using formula: Volume of cone $=\dfrac{1}{3}\times\pi\times3^2\times(13-7)=18\pi$ or using integration: Volume of cone $=\pi\int_7^{13}\left(\dfrac{13}{2}-\dfrac{y}{2}\right)^2 \mathrm{d}y=\dfrac{\pi}{4}\left[169y-13y^2+\dfrac{y^3}{3}\right]_7^{13}=18\pi$	B1
	<u>Volume of solid generated by rotating the curve:</u> When $x=0, y=-2$ Volume $=\pi\int_{-2}^{7}(y+2)\ \mathrm{d}y=\pi\left[\dfrac{y^2}{2}+2y\right]_{-2}^{7}$ $=\pi\left\{\left(\dfrac{49}{2}+14\right)-\left(\dfrac{(-2)^2}{2}+(-4)\right)\right\}=\dfrac{81}{2}\pi$ Total volume $=18\pi+\dfrac{81}{2}\pi=\dfrac{117}{2}\pi$ oe	 M1M1 ddM1 A1 A1 [9]
		Total 9 marks

	M1	Attempt to solve $y+2x=13$ with $y=x^2-2$ and obtain a three term quadratic in *x* or *y*. ($x^2+2x-15=0$ or $y^2-30y+161=0$) (Condone = 0 missing.)
	M1	Attempt to solve (see general principles for marking quadratics).
	A1	$y=7$
	B1	18π correct volume of cone, in terms of π.
	M1	Correct integral for volume generated by rotating curve. Volume $=\pm\pi\int_{(-2)}^{(7)}(y+2)\ (\mathrm{d}y)$ Ignore limits and condone d*y* omitted or with the wrong variable.
	M1	Evidence of completing integration (see general principles for integration). Ignore limits. π may be missing. If $y+2$ is combined with another expression in an attempt to add or subtract two volumes, you may accept evidence of integration for the combined expression.
	dd M1	Dep on previous two M marks. Substitute both correct limits $y=-2$ and $y=7$ into the result of their integration. The full substitution should be shown unless the answer is $\frac{81}{2}\pi$ oe.
	A1	$\frac{81}{2}\pi$ oe, given in terms of π. A correct answer from the correct integration implies M1 for a correct substitution of limits.
	A1	$\frac{117}{2}\pi$ oe, correct total volume, in terms of π.