Question	Scheme	Marks	AOs
13(a)	Attempts $\frac{\mathrm{d}y}{\mathrm{d}x}=\frac{\frac{\mathrm{d}y}{\mathrm{d}t}}{\frac{\mathrm{d}x}{\mathrm{d}t}}=\frac{4\cos\left(t-\frac{\pi}{4}\right)}{\sec^2 t}$	M1 A1	1.1b 1.1b
		(2)	
(b)(i)	Solves $\cos\left(t-\frac{\pi}{4}\right)=0$ leading to $t=\ldots$	M1	1.1b
	$x=\tan\frac{3\pi}{4}=-1$ or $x=\tan\frac{7\pi}{4}=-1$ *	A1*	2.1
(b)(ii)	Both $(-1,4)$ and $(-1,-4)$	A1	1.1b
		(3)	
(c)(i)	$y=4\sin\left(t-\frac{\pi}{4}\right)=4\left(\sin t\cos\frac{\pi}{4}-\sin\frac{\pi}{4}\cos t\right)$	M1	1.1b
	$=4\left(x\cos t\cos\frac{\pi}{4}-\sin\frac{\pi}{4}\cos t\right)$	dM1	3.1a
	$y=\frac{2\sqrt{2}(x-1)}{\sec t}$ *	A1*	2.1
(c)(ii)	Squares $y^2=\frac{k(x-1)^2}{\sec^2 t}$ and uses $\tan^2 t+1=\sec^2 t$	M1	3.1a
	$y^2=\frac{8(x-1)^2}{x^2+1}$	A1	2.1
		(5)	
		(10 marks)	

Notes:

(a)

M1: Attempts $\frac{\mathrm{d}y}{\mathrm{d}x}=\frac{\frac{\mathrm{d}y}{\mathrm{d}t}}{\frac{\mathrm{d}x}{\mathrm{d}t}}$

There must be some attempt to differentiate both parameters however poor and divide the right way round.

A1: $\frac{\mathrm{d}y}{\mathrm{d}x}=\frac{4\cos\left(t-\frac{\pi}{4}\right)}{\sec^2 t}$ Correct expression in any form. May be implied.

(b)

M1: Sets their $\frac{\mathrm{d}y}{\mathrm{d}t}=0$ and solves for t

A1*: cso Attempts $x=\tan t$ for at least one of their correct values of t and achieves $x=-1$

Requires $\frac{dy}{dt}$ to be correct. Note that the correct values of t are $t=\frac{3\pi}{4}$ and $t=\frac{7\pi}{4}$ {accept e.g. $\frac{11\pi}{4}$ or $-\frac{\pi}{4}$ } **A1:** Both $(-1,4)$ and $(-1,-4)$
(c)(i) **M1:** Attempts the addition formulae $\sin\left(t-\frac{\pi}{4}\right)=\sin t\cos\frac{\pi}{4}-\sin\frac{\pi}{4}\cos t$, condoning a sign slip. **dM1:** Uses $\tan t=\frac{\sin t}{\cos t}$ to write $\sin t=x\cos t$ or equivalent **A1*:** Arrives at $y=\frac{2\sqrt{2}(x-1)}{\sec t}$ following correct work $\sin t$ must be replaced by $x\cos t$ or $\frac{x}{\sec t}$ before the final line.
(c)(ii) **M1:** Attempts to square the given answer to (c) $y^2=\frac{k(x-1)^2}{\sec^2 t}$ and attempts to use $\pm\tan^2 t\pm1=\pm\sec^2 t$ **A1:** $y^2=\frac{8(x-1)^2}{x^2+1}$