	A1: Obtains awrt 130 (**2 sf**). Not ft Answer only of 130 (131.176059... or 129.50219... (accurate)) is 00	
		(2)
		(Total 7 marks)

Question Number	Scheme	Notes	Marks
6	$x=\left(3\sin 2y-\dfrac{6y}{\pi}\right)^2=9\sin^2 2y-\dfrac{36}{\pi}y\sin 2y+\dfrac{36y^2}{\pi^2}$ or $x^{\frac{1}{2}}=3\sin 2y-\dfrac{6y}{\pi}$		
	e.g., $\dfrac{\mathrm{d}x}{\mathrm{d}y}=2\left(3\sin 2y-\dfrac{6y}{\pi}\right)\left(6\cos 2y-\dfrac{6}{\pi}\right)$ or $\dfrac{\mathrm{d}x}{\mathrm{d}y}=36\sin 2y\cos 2y-\dfrac{36}{\pi}\sin 2y-\dfrac{72y}{\pi}\cos 2y+\dfrac{72y}{\pi^2}$ or $\dfrac{1}{2}x^{-\frac{1}{2}}\dfrac{\mathrm{d}x}{\mathrm{d}y}=6\cos 2y-\dfrac{6}{\pi}$ and may see these as $\dfrac{\mathrm{d}y}{\mathrm{d}x}=1\Big/\ldots$ or $1=2\left(3\sin 2y-\dfrac{6y}{\pi}\right)\left(6\cos 2y\dfrac{\mathrm{d}y}{\mathrm{d}x}-\dfrac{6}{\pi}\dfrac{\mathrm{d}y}{\mathrm{d}x}\right)$ $1=36\sin 2y\cos 2y\dfrac{\mathrm{d}y}{\mathrm{d}x}-\dfrac{36}{\pi}\left(\sin 2y+2y\cos 2y\right)\dfrac{\mathrm{d}y}{\mathrm{d}x}+\dfrac{72y}{\pi^2}\dfrac{\mathrm{d}y}{\mathrm{d}x}$ or $\dfrac{1}{2}x^{-\frac{1}{2}}=\left(6\cos 2y-\dfrac{6}{\pi}\right)\dfrac{\mathrm{d}y}{\mathrm{d}x}$ M1: Differentiates to achieve any correct form (sign/coefficient errors only) of an equation in $\dfrac{\mathrm{d}x}{\mathrm{d}y}$ $\left(\text{or } \dfrac{\mathrm{d}y}{\mathrm{d}x}\right)$. Bracketing errors must be recovered. If any trig identities are used e.g., $\sin 2y\cos 2y\to\frac{1}{2}\sin 4y$ condone sign errors only but ISW. Note that $\frac{\mathrm{d}}{\mathrm{d}y}\left(9\sin^2 2y\right)=\frac{\mathrm{d}}{\mathrm{d}y}\left(\frac{9}{2}-\frac{9}{2}\cos 4y\right)=18\sin 4y$ A1: Correct differentiation. ISW once a correct equation is seen	**M1** **A1**
	$\dfrac{\mathrm{d}x}{\mathrm{d}y}=2\left(6\cos\dfrac{\pi}{2}-\dfrac{6}{\pi}\right)\left(3\sin\dfrac{\pi}{2}-\dfrac{3}{2}\right)=-\dfrac{18}{\pi}\quad\{=-5.7...\}\Rightarrow\dfrac{\mathrm{d}y}{\mathrm{d}x}=-\dfrac{\pi}{18}\quad(=-0.17...)$ Via $\frac{\mathrm{d}x}{\mathrm{d}y}$: Substitutes in $y=\frac{\pi}{4}$ (and $x=\text{"}\frac{9}{4}\text{"}$ if necessary) and uses $\frac{\mathrm{d}y}{\mathrm{d}x}=1/\frac{\mathrm{d}x}{\mathrm{d}y}$ to find a value/numerical expression for $\frac{\mathrm{d}y}{\mathrm{d}x}$ with all trig evaluated, which could be a decimal. Implied by $\dfrac{\mathrm{d}y}{\mathrm{d}x}=-\dfrac{\pi}{18}\quad(=-0.17...)$. This could be done in either order. There may be slips including incorrect reciprocation e.g., $1\Big/\frac{a}{b}+\frac{c}{d}\to\frac{b}{a}+\frac{d}{c}$ but there must be evidence of an attempt to use the correct $\frac{\mathrm{d}y}{\mathrm{d}x}=1/\frac{\mathrm{d}x}{\mathrm{d}y}$ with the correct coordinate value/s and $\frac{\mathrm{d}y}{\mathrm{d}x}=-1/\frac{\mathrm{d}x}{\mathrm{d}y}$ is **d**M0. If only a value is given for $\frac{\mathrm{d}x}{\mathrm{d}y}$ followed by one for $\frac{\mathrm{d}y}{\mathrm{d}x}$ the values must imply $\frac{\mathrm{d}y}{\mathrm{d}x}=1/\frac{\mathrm{d}x}{\mathrm{d}y}$ Via $\frac{\mathrm{d}y}{\mathrm{d}x}$: Alternatively obtains a value/num. expression with all trig evaluated by substituting the correct values and making $\frac{\mathrm{d}y}{\mathrm{d}x}$ the subject (either order). Allow slips.		**dM1**
	x coordinate of P is $\dfrac{9}{4}$ or $\{P\}\left(\dfrac{9}{4},\ \dfrac{\pi}{4}\right)$	Correct x-coordinate of P Allow equivalent single fractions. No working required	**B1**
	$0-\dfrac{\pi}{4}=-\dfrac{\pi}{18}\left(x-\dfrac{9}{4}\right)\Rightarrow x=...,\ \dfrac{27}{4}$ or $\dfrac{\pi}{4}=-\dfrac{\pi}{18}\left(\dfrac{9}{4}\right)+c\Rightarrow c=\dfrac{3\pi}{8}\Rightarrow-\dfrac{\pi}{18}x=-\dfrac{3\pi}{8}\Rightarrow x=...,\ \dfrac{27}{4}$ M1: Uses a straight line equation method - initial equation correct- ft their value/expression for $\frac{\mathrm{d}y}{\mathrm{d}x}$ with their non-zero x coordinate and the given y coordinate and proceeds to find a value/expression for x by setting $y=0$. Not a dependent mark but must follow a credible		**M1** **A1**

	attempt to differentiate and obtain a value for $\frac{dy}{dx}$ using $y = \frac{\pi}{4}$ appropriately and do not condone clear use of an unchanged $\frac{dx}{dy}$ in the line equation. A1: Correct x-coordinate of Q. Requires all previous marks.	
		(Total 6 marks)