Question Number	Scheme	Notes	Marks
4.	$y = \text{artanh}\left(\dfrac{\cos x + a}{\cos x - a}\right)$		
	$\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{1}{1-\left(\dfrac{\cos x+a}{\cos x-a}\right)^2} \times \dfrac{(\cos x - a)\times -\sin x - (\cos x + a)\times -\sin x}{(\cos x - a)^2}$ or $\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{1}{1-\left(\dfrac{\cos x+a}{\cos x-a}\right)^2} \times \left(-\sin x \times (\cos x - a)^{-1} + (\cos x + a)\times \sin x (\cos x - a)^{-2}\right)$ M1: Correct method for the derivative. This requires $\dfrac{1}{1-\left(\dfrac{\cos x+a}{\cos x-a}\right)^2} \times$ An attempt at the quotient (or product) rule. A1: Correct derivative in any form		M1A1
	$= \dfrac{(\cos x - a)^2}{(\cos x - a)^2 - (\cos x + a)^2} \times \dfrac{2a\sin x}{(\cos x - a)^2} = \dfrac{2a\sin x}{-4a\cos x} = \ldots$ Uses correct processing to reach $\lambda \dfrac{\sin x}{\cos x}$ or $\lambda \tan x$ **Depends on the first method mark.**		dM1
	$= -\dfrac{1}{2}\tan x$	cso	A1 **(4)**
Way 2	$y = \text{artanh}\left(\dfrac{\cos x+a}{\cos x-a}\right) \Rightarrow \tanh y = \dfrac{\cos x+a}{\cos x-a} \Rightarrow \text{sech}^2 y \dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{2a\sin x}{(\cos x - a)^2}$ Takes tanh of both sides, obtains $\text{sech}^2 y \dfrac{\mathrm{d}y}{\mathrm{d}x} =$ an attempt at the quotient or product rule		M1
	$\dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{1}{1-\left(\dfrac{\cos x+a}{\cos x-a}\right)^2} \times \dfrac{2a\sin x}{(\cos x - a)^2}$ Correct derivative in any form		A1
	$= \dfrac{(\cos x - a)^2}{(\cos x - a)^2 - (\cos x + a)^2} \times \dfrac{2a\sin x}{(\cos x - a)^2} = \dfrac{2a\sin x}{-4a\cos x} = \ldots$ Uses correct processing to reach $\lambda \dfrac{\sin x}{\cos x}$ or $\lambda \tan x$ **Depends on the first method mark.**		dM1
	$= -\dfrac{1}{2}\tan x$	cso	A1 **(4)**

Way 3	Uses substitution $u=\dfrac{\cos x+a}{\cos x-a}$, obtains $\dfrac{\mathrm{d}u}{\mathrm{d}x}\left(=\dfrac{2a\sin x}{(\cos x-a)^2}\right)$ by quotient rule and $\dfrac{\mathrm{d}y}{\mathrm{d}u}\left(=\dfrac{1}{1-u^2}\right)$ followed by chain rule to obtain $\dfrac{\mathrm{d}y}{\mathrm{d}x}=\dfrac{1}{1-\left(\dfrac{\cos x+a}{\cos x-a}\right)^2}\times\dfrac{2a\sin x}{(\cos x-a)^2}$		M1
	Correct derivative in any form		A1
	Uses correct processing to reach $\lambda\dfrac{\sin x}{\cos x}$ or $\lambda\tan x$ **Depends on the first method mark.**		dM1
	$=-\dfrac{1}{2}\tan x$	cso	A1 **(4)**
			Total 4
Way 4	$y=\dfrac{1}{2}\ln\left(\dfrac{1+\dfrac{\cos x+a}{\cos x-a}}{1-\dfrac{\cos x+a}{\cos x-a}}\right)=\dfrac{1}{2}\ln\left(-\dfrac{\cos x}{a}\right)$ $\dfrac{\mathrm{d}y}{\mathrm{d}x}=\dfrac{1}{2}\times\dfrac{1}{-\dfrac{\cos x}{a}}\times\left(\dfrac{\sin x}{a}\right)$	M1: Converts to correct ln form and uses chain rule to differentiate A1: Correct derivative in any form	M1A1
	Uses correct processing to reach $\lambda\dfrac{\sin x}{\cos x}$ or $\lambda\tan x$ **Depends on the first method mark.**		dM1
	$=-\dfrac{1}{2}\tan x$	cso	A1
			(4)