4(i)	$\mathrm{f}(x) = x\arccos x,\ -1 \le x \le 1,$		
	$\mathrm{f}'(x) = \arccos x - \dfrac{x}{\sqrt{1-x^2}}$ M1: Differentiates using the product rule to obtain an expression of the form: $\arccos x \pm \dfrac{x}{\sqrt{1-x^2}}$ A1: Correct derivative		M1A1
	$\mathrm{f}'(0.5) = \arccos 0.5 - \dfrac{0.5}{\sqrt{1-0.5^2}} = \dfrac{\pi-\sqrt{3}}{3}$	$\dfrac{\pi-\sqrt{3}}{3}$ oe e.g. $\dfrac{\pi}{3} - \dfrac{1}{\sqrt{3}}$	A1
			(3)
(ii)	$\mathrm{g}(x) = \arctan(\mathrm{e}^{2x})$		
	$\mathrm{g}'(x) = \dfrac{2\mathrm{e}^{2x}}{\mathrm{e}^{4x}+1}$ M1: Differentiates using the chain rule to obtain an expression of the form: $\dfrac{k\mathrm{e}^{2x}}{\left(\mathrm{e}^{2x}\right)^2+1}$ A1: Correct derivative in any form		M1A1
	$\mathrm{g}'(x) = \dfrac{2}{\mathrm{e}^{2x}+\mathrm{e}^{-2x}} = \operatorname{sech}(2x)$	Introduces sech(2x). Depends on previous M.	**d**M1
	$\mathrm{g}''(x) = -2\operatorname{sech}(2x)\tanh(2x)$	Differentiates $\operatorname{sech}(u) \to \pm \operatorname{sech} u \tanh u$ Depends on both previous M's.	**d**M1
		Correct expression.	A1
			(5)
(ii) **ALT 1**	$\mathrm{g}'(x) = \dfrac{2\mathrm{e}^{2x}}{\mathrm{e}^{4x}+1}$ M1: Differentiates using the chain rule to obtain an expression of the form: $\dfrac{k\mathrm{e}^{2x}}{\left(\mathrm{e}^{2x}\right)^2+1}$ A1: Correct derivative in any form		M1A1
	$\mathrm{g}''(x) = \dfrac{4\mathrm{e}^{2x}\left(1+\mathrm{e}^{4x}\right) - 4\mathrm{e}^{4x}\times 2\mathrm{e}^{2x}}{(\mathrm{e}^{4x}+1)^2}$	Differentiates using quotient or product rule. Depends on first M.	**d**M1
	$= \dfrac{4\mathrm{e}^{2x} - 4\mathrm{e}^{6x}}{(\mathrm{e}^{4x}+1)^2} = \dfrac{-4(\mathrm{e}^{2x}-\mathrm{e}^{-2x})}{(\mathrm{e}^{2x}+\mathrm{e}^{-2x})^2}$	Multiply through by e^{-4x}. Depends on both previous M's.	**d**M1
	$= -2\dfrac{2}{\mathrm{e}^{2x}+\mathrm{e}^{-2x}}\dfrac{\mathrm{e}^{2x}-\mathrm{e}^{-2x}}{\mathrm{e}^{2x}+\mathrm{e}^{-2x}}$ $= -2\operatorname{sech} 2x \tanh 2x$	Correct expression.	A1
	Note that the first derivative may be obtained implicitly in either method e.g. $y = \arctan\left(\mathrm{e}^{2x}\right) \Rightarrow \tan y = \mathrm{e}^{2x} \Rightarrow \sec^2 y \dfrac{\mathrm{d}y}{\mathrm{d}x} = 2\mathrm{e}^{2x} \Rightarrow \dfrac{\mathrm{d}y}{\mathrm{d}x} = \dfrac{2\mathrm{e}^{2x}}{1+\left(\mathrm{e}^{2x}\right)^2}$		
			Total 8

Question Number	Scheme	Notes	Marks
5.	$I_n = \int \sec^n x\,\mathrm{d}x, \qquad n \ge 0$		