

Question	Answer	Marks	Guidance
(a)	Use correct product rule or quotient rule, and attempt at chain rule	M1	$ke^{-4x} \tan x + e^{-4x} \sec^2 x$ or $\frac{e^{4x} \sec^2 x - \tan x(ke^{4x})}{(e^{4x})^2}$ Need to see $d(\tan x)/dx = \sec^2 x$ (formula sheet) and attempt at ke^{-4x} , where $k \neq 1$.
	Obtain correct derivative in any form	A1	$-4e^{-4x} \tan x + e^{-4x} \sec^2 x$ or $\frac{e^{4x} \sec^2 x - \tan x(4e^{4x})}{(e^{4x})^2}$
	Use trigonometric formulae to express derivative in the form $ke^{-4x} \sin x \cos x \sec^2 x + ae^{-4x} \sec^2 x$ or $ke^{-4x} \frac{\sin x \cos x}{\cos x \cos x} + ae^{-4x} \sec^2 x$ or $\sec^2 x(ke^{-4x} \sin x \cos x + ae^{-4x})$ Allow $\frac{1}{\cos^2 x}$ instead of $\sec^2 x$	M1	Need to use $\frac{\tan x}{\sec^2 x} = \sin x \cos x$ or $\tan x = \frac{\sin x}{\cos x} \cdot \frac{\cos x}{\cos x}$ OE. M1 is independent of previous M1, but expression must be of appropriate form.
	Obtain correct answer with $a = 1$ and $b = -2$	A1	At least one line of trigonometric working is required from $-4e^{-4x} \tan x + e^{-4x} \sec^2 x$ to given answer $\sec^2 x(1 - 2 \sin 2x) e^{-4x}$ with elements in any order. If only error: $4 \sin x \cos x = 4 \sin 2x$ M1 A1 M1 A0.
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Question	Answer	Marks	Guidance
(b)	Equate derivative to zero and use correct method to solve for x	M1	$\sin 2x = \frac{1}{2}$, hence $x = \frac{1}{2} \sin^{-1} \frac{1}{2}$ or $x = \tan^{-1}(2 \pm \sqrt{3})$ Allow M1 for correct method for non-exact value.
	Obtain answer, e.g. $x = \frac{1}{12}\pi$	A1	[0.262 M1 A0]
	Obtain second answer, e.g. $\frac{5}{12}\pi$ and no other in the given interval	A1 FT	FT $\frac{\pi - \text{their } 2x}{2}$ if exact values; x must be $< \frac{\pi}{2}$. Ignore answers outside the given interval. Treat answers in degrees as a misread. 15°, 75°. SC No values found for a and b in 4(a) but chooses values in 4(b) : max M1 for x .
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