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08	**3b**	(i) Differentiate $\log_e(\cos x)$ with respect to x. (ii) Hence, or otherwise, evaluate $\int_0^{\frac{\pi}{4}} \tan x \, dx$.	**2** **2**

i. $\frac{d}{dx}[\log_e(\cos x)] = \frac{-\sin x}{\cos x}$ (as $\frac{d}{dx}[\log_e f(x)] = \frac{f'(x)}{f(x)}$)

$= -\tan x$

ii. $\int_0^{\frac{\pi}{4}} \tan x \, dx = \left[-\log_e(\cos x)\right]_0^{\frac{\pi}{4}}$

$= -[\log_e(\cos\frac{\pi}{4} - \cos 0)]$

$= -[\log_e \frac{1}{\sqrt{2}} - \log_e 1]$

$= -[\log_e \frac{1}{\sqrt{2}} - 0]$

$= -\log_e \frac{1}{\sqrt{2}}$

$= \log_e \sqrt{2}$

$= \log_e 2^{\frac{1}{2}}$

$= \frac{1}{2}\log_e 2$

* These solutions have been provided by *projectmaths* and are not supplied or endorsed by the Board of Studies

Board of Studies: Notes from the Marking Centre

(i) Better responses demonstrated an understanding that the chain rule rather than the product rule was required and that the derivative of $\cos x$ is $-\sin x$.

(ii) In better responses, candidates recognised the connection between parts (i) and (ii) and correctly placed the negative sign. Candidates are reminded that it is important to show the first line of substitution into the primitive function.

Source: http://www.boardofstudies.nsw.edu.au/hsc_exams/