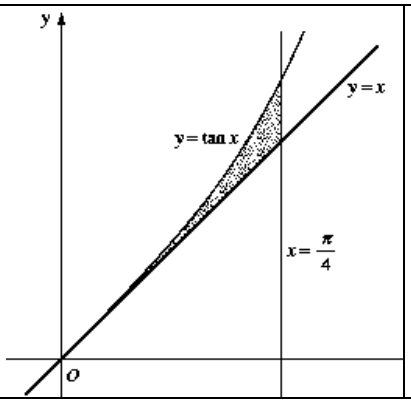
06	**5b**	(i) Show that $\frac{d}{dx}\log_e(\cos x) = -\tan x$.	**1**
		(ii) The shaded region in the diagram is bounded by the curve $y = \tan x$ and the lines $y = x$ and $x = \frac{\pi}{4}$. Using the result of part (i), or otherwise, find the area of the shaded region.	**3**



(i) $\frac{d}{dx}\log_e(\cos x) = \frac{-\sin x}{\cos x}$

$= -\tan x$

(ii) Area $= \int_0^{\frac{\pi}{4}} \tan x - x \ dx$ From (i), $\int \tan x \ dx = -\log_e(\cos x) + c$

$= \left[-\log_e(\cos x) - \frac{x^2}{2}\right]_0^{\frac{\pi}{4}}$

$= -\log_e(\cos\frac{\pi}{4}) - ((\frac{\pi}{4})^2) \div 2 - (-\log_e(\cos 0) - 0)$

$= -\log_e \frac{1}{\sqrt{2}} - \frac{\pi^2}{32}$ - (-log 1 – 0)

$= \frac{1}{2}\log_e 2 - \frac{\pi^2}{32}$

$= 0.038148452 \ldots$

$= 0.038$ (3 dec pl) $\therefore$ area of 0.038 m^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) The majority of candidates were successful in this part.

(ii) This part was not done well. Successful candidates recognised the connection between parts (i) and (ii) and were able to place the negative sign correctly.

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