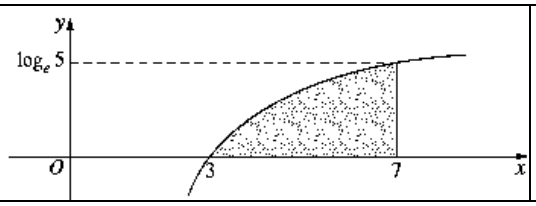
08	**10 a**	In the diagram, the shaded region is bounded by $y = \log_e(x - 2)$, the x-axis and the line $x = 7$. Find the exact value of the area of the shaded region.		**5**

Area = $7 \times \log_e 5$ – area between curve and y-axis

As $y = \log_e(x - 2)$,
$e^y = x - 2$
$x = e^y + 2$

$$\text{Area} = 7\log_e 5 - \int_0^{\log_e 5} (e^y + 2)\,dy$$

$$= 7\log_e 5 - \left[e^y + 2y\right]_0^{\log_e 5}$$

$$= 7\log_e 5 - \left[e^{\log_e 5} + 2\log_e 5 - (e^0 + 0)\right]$$

$$= 7\log_e 5 - 5 - 2\log_e 5 + 1$$

$$= 5\log_e 5 - 4$$

$\therefore$ $(5\log_e 5 - 4)$ units^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

Many responses contained an initial line of working which could lead to the correct solution and so gained a mark. In most of the successful responses, candidates correctly made x the subject of the equation, although some were careless with their operations. The most successful technique was to find the area between the lines $x = 7$ and $x = e^y + 2$ with respect to the y-axis between the limits $y = 0$ and $y = \log_e 5$. Some attempted to subtract the area with respect to the y-axis from the area of the rectangle but did not complete this successfully, either not attempting the subtraction or not completing it correctly. Some candidates obtained the correct solution using a substitution or, on rare occasions, integration by parts. Candidates are reminded to refer to their standard integral table, as this may have prevented some candidates from attempting to integrate $\log_e(x - 2)$ with respect to the x-axis directly.

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