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10	4d	Let $f(x) = 1 + e^x$. Show that $f(x) \times f(-x) = f(x) + f(-x)$.	2
$f(x) = 1 + e^x$ $\begin{aligned} \text{LHS} &= f(x) \times f(-x) \\ &= (1 + e^x)(1 + e^{-x}) \\ &= 1 + e^{-x} + e^x + e^0 \\ &= 2 + e^{-x} + e^x \end{aligned}$ $\begin{aligned} \text{RHS} &= f(x) + f(-x) \\ &= 1 + e^x + 1 + e^{-x} \\ &= 2 + e^{-x} + e^x \end{aligned}$ $\therefore \text{LHS} = \text{RHS}$			State Mean: 1.25/2

* 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

Most candidates correctly used $f(-x) = 1 + e^{-x}$ to prove the identity. Better responses worked from one side, usually the left-hand side, to the other to complete their proof, writing either $e^{-x}e^x$ or e^0 before simplifying to 1. Common errors involved an incorrect expression for $f(-x)$, or an incorrect simplification of $e^{-x}e^x$, or not knowing that e^0 equals 1. Many responses indicated that $2 + e^x + e^{-x}$ was the desired result and forced their expansion of $f(x)f(-x)$ to achieve that result. Rewriting e^{-x} with $\frac{1}{e^x}$ was a useful step for a number of candidates. Candidates are reminded that substitution of particular values of x does not constitute proof.

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