

## STEP III, 2022, Q4 EC

### Question 4

This was the fourth most popular question being attempted by more than four fifths of the candidates, with a moderate degree of success scoring a mean of 9/20.

Part (i) suffered from incorrect flows of logic in the inductive and base cases, as well as failure to mention anything about not dividing by zero.

In part (ii) many ignored the instruction to use the Maclaurin series, and used de L'Hopital's Rule to their cost, and some ignored the higher order terms.

Part (iii) was generally well done, though the most common error was not justifying the evaluation of the product using a geometric series in the exponent.

For part (iv), the best attempted route was to use an imaginary substitution which led to mostly successful solutions. Some candidates attempted to prove an analogous trigonometric identity using similar arguments to the previous parts, however losing marks for not sufficiently fleshing out the details, and some attempted to use Osborn's Rule, often with insufficient justification or stating that it was being used. Once the identity was achieved, the calculation was generally done well if the candidate progressed this far.



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