

STEP II, 2020, Q3 EC

This was the second least attempted of the pure questions. Relatively few candidates made a complete attempt at all of the parts and only 4 achieved full marks for the question.

The question consisted of a succession of given results which were to be established. Thus, candidates needed to be more aware of the importance of providing careful and thorough explanations and justifications for each step that they took along the way. Many marks were lost as a result of carelessness in providing all of the necessary details.

A significant number of candidates thought that the implication in (i) showed that the sequence was either increasing or decreasing and so got little or no credit. Establishing the given relations in (i) was generally done quite well, with candidates demonstrating a considerable range of algebraic skills in their working. But then a lot of candidates failed to show that the sequence was positive, which undermined their attempts to deduce that the sequence was unimodal.

Many candidates used an induction proof for the first proof in part (ii) despite the fact that a more direct approach was possible and considerably simpler. The “asked-for” induction proof was usually handled well, though establishing the baseline case was often flawed; many either overlooked the need to establish both of the cases $n = 1$ and $n = 2$ or, when giving a one-step induction proof with the help of the previously-established result, chose an incorrect baseline case.

The final part of the question was often avoided, though full attempts often gained full credit. Again, the usual oversight was to fail to establish positivity. Many of those who produced only a faltering solution here overlooked the need to compare successive terms, usually merely working with an expression for u_r only, often with the use of differentiation - attempts along such lines invariably lost all of the final 7 marks allocated, primarily because the required result is based on discrete values of r while calculus works with continuous values.



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