

STEP III, 2023, Q8 EC

Question 8

This was only a little less popular than question 2 and was only answered with moderate success having a mean score of 7.3/20.

Part (i) was mostly well answered, although some candidates lost marks by not being thorough in demonstrating the inequality, or by using a characteristic equation and failing to verify their solution as required.

Part (ii) was found difficult, for although g_1 was almost always stated, many struggled to find g_2 , often just flipping the sign of g_1 . Even when a general solution was found, many candidates used the boundary conditions of (i) instead of appreciating the sign change of the derivative at $x = 1$.

Part (iii) was done extremely poorly, even by candidates who had the right functions and the algebraic relationship between them.

Candidates could often pick up marks on part (iv), even if they were less successful with the rest of the question, though notation of what derivatives were being taken was often ambiguous.

In attempting to answer part (v), many candidates knew they needed to use the result of part (iv) for part (a), although a significant number lost marks for giving no explanation or working. Part (b) proved much harder than part (a), since few candidates realized they had to match their function at $\frac{5}{4}\pi$, not at $-\frac{1}{4}\pi$ again. Some candidates fully solved both (a) and (b) directly via the characteristic equation which led to a very lengthy solution.



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