

STEP III, 2018, Q1 EC

Question 1

As usual, this was the most popular question to be attempted with more than 93% of candidates doing so. However, scoring for it was only moderately good with a mean below 9/20. Most successfully differentiated and obtained a value for β from the cubic but ignored considering whether this was the only stationary point. Sketches frequently did not display the asymptote; some that did showed the negative branch of the curve touching rather than intersecting the asymptote at the maximum. Many did not appreciate that to sketch the second curve in part (i) it was not sufficient to just offer a drawing without the working; the horizontal point of inflection and asymptote were frequent casualties. Part (ii) was straightforward for most. Many recognised that part (iii) made use of the first function $f(\beta)$, provided that they used the condition to substitute for α . However, their justification suffered from ignoring the reality condition and using specious arguments, as a consequence. Part (iv) followed a similar trend to part (iii), except using (β) , and only differing in that of those that did apply the reality condition, quite a few overlooked $\beta = 1$ as a solution of the cubic inequality, and so their final answer was wrong.



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