

STEP II, 2009, Q2 EC

Q2 Another of the less popular pure maths questions. It is clear that many A-level students are deeply suspicious of approximations and logarithms, and these plus the fact that y is a “function of a function of a function” clearly signalled to many to pass by on the other side. Of those who did take up the challenge here, almost all plumped automatically for differentiation in (i), usually by taking logs first and then differentiating implicitly. Just a few knew how to differentiate directly using the fact that $a^x = e^{x \ln a}$. However, calculus was not actually required, since the maxima and minima of y can be deduced immediately from knowledge of the sine function. It then helped candidates enormously if they were able to work generally in deciding what values of x gave these stationary points, not least because they would need some care in figuring out which to use in (iv). It was a pleasant surprise to find that (ii) was generally handled quite well, but sketches were poor – usually as a result of previous shortcomings – especially for $x < 0$; many candidates did realise, almost independently of previous working it seemed, that the right-hand ‘half’ of the curve oscillated increasingly tightly. In (iv), a lack of clarity regarding the x -values, allied to an uncertainty over dealing with the logs, proved a great hindrance to the majority. Also, it has to be said that, even amongst those *with* the right k ’s to hand, a simple diagram of what they were attempting to work with would undoubtedly have saved them a lot of mark-spurning algebraic drivel.



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