

STEP II, 2017, Q3 EC

Attempts fell to around the 50% figure with marks scored by those who attempted the question averaging about 10 out of 20. There is not much to this question beyond the baseline realisation that $\sin y = \sin x$ does not necessarily imply that $y = x$. In essence, it is all about “quadrants” work, where candidates need to consider the two solutions, x and $\pi - x$ in one period of the sine function, and then adding or subtracting multiples of 2π as necessary. Once one has done this, the accompanying straight-line segments are straightforward marks in the last part of (i).

A lot of marks were gained in (ii), as candidates were clearly attracted by the familiar “differentiate this couple of times” demand; most of them were quite happy with the differentiation, performed either implicitly or directly using arcsines.

The drawings required in (ii) and (iii) then relied on an appreciation of the symmetries of the sine function, along with the use of the identity $\cos y \equiv \sin\left(\frac{1}{2}\pi - y\right)$.



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