STEP II, 2008, Q1 EC

Q1 The first question is invariably intended to be a gentle introduction to the paper, and to allow all candidates to gain some marks without making great demands on either memory or technical skills. As such, most candidates traditionally tend to begin with question 1, and this proved to be the case here. Almost 700 candidates attempted this question, making it (marginally) the second most popular question on the paper; and it gained the highest mean score of about 14 marks.

There were still several places where marks were commonly lost. In (i), setting $(x_2, y_2) = (x_1, y_1)$ and eliminating y (for instance) leads to a quartic equation in x. There were two straightforward linear factors easily found to the quartic expression, leaving a quadratic factor which could yield no real roots. Many candidates failed to explain why, or show that, this was so. In (ii), the algebra again leads to two solutions, gained by setting $(x_3, y_3) = (x_1, y_1)$. However, one of them corresponds to one of the solutions already found in (i), where the sequence is constant, and most candidates omitted either to notice this or

to discover it by checking. Another very common oversight – although far less important in the sense that candidates could still gain all the marks by going the long way round – was that the algebra in (ii) was *exactly the same* as that in (i), but with $a = -x$ and $b = -y$. For the very few who noticed this, the working for the second half of the question was remarkably swift.