

## STEP III, 2020, Q5 EC

A popular question, which was well attempted with a fair degree of success: it was marginally less popular than question 2, but marginally more successful. Most submitted quite a large amount of work, and were able to attempt later parts even if earlier parts were not successful as key results (requiring proof) were quoted in each part. The stem was mostly well completed, by a variety of methods, namely, re-summing indices, induction, or geometric series, though there were some candidates who seemed to think it was obvious and produced no working. Part (i) (a) was also well completed though few received full marks. The main problems were finding  $A$  and that  $F(x)$  is not defined for  $x = k$ . The second result in this part was better done, though some candidates struggled with re-summing when changing indices. For (i) (b), many did not realise that they needed to differentiate both sides. Differentiation errors and confusion thwarted many that did differentiate. Part (ii) was well done by candidates that attempted it with most realising that they could use the result of (i) (b). Though many lost marks for failing to show how to take the limit of the logarithm, most realised that they need to use partial fractions to complete the integral. Some candidates sadly left their expressions in terms of  $k$ .



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