

## STEP II, 2020, Q6 EC

This was the second most popular question on the paper. In general, candidates need to be careful when proving statements of the form “A if and only if B” and should be aware that in some cases it may not be possible to prove both directions in one go. Candidates should also be aware that, in some cases, the algebra is not sufficient on its own to demonstrate the reasoning and explanations of the steps are often helpful.

Part (i) of the question was generally completed well. In part (ii) many largely successful attempts were seen, but few candidates picked up all of the marks for this section. The main errors arose from not adequately considering cases and so dividing by 0, and from not noticing that  $a^2 = d^2 = 1$  could result in  $a = -d = \pm 1$ . The most successful attempts in this part were the ones that separated the two directions of the implications. Many candidates misused the condition  $M \neq \pm I$  in trying to prove the implication in one direction or did not check this condition when proving the implication in the opposite direction.

Few attempts at part (iii) were seen and a common mistake was to do the component-wise algebra to find  $M^4$  instead of using the results from previous parts. In general, those who had understood the previous parts and attempted part (iv) were able to solve the final part of the question.



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