



QUESTION WORKBOOK

Diagonalisation and the Cayley–Hamilton theorem

Further Pure 2 · Year FM

6 questions · 21 marks

NAVY SCREEN EDITION

SECTION A · Warm-up

- A1** M has rows $(4, 1)$ and $(2, 3)$, with eigenvalues 5 and 2 and eigenvectors $(1, 1)$ and $(1, -2)$. Write down P and D with $M = PDP^{-1}$. [3]

- A2** Use that diagonalisation to find M^5 . [3]

SECTION B · Standard

- B1** State the Cayley-Hamilton theorem and verify it for M . [4]

- B2** Use the Cayley-Hamilton theorem to express M^{-1} in terms of M and I , and evaluate it. [4]

- B3** Give a 2 by 2 matrix that cannot be diagonalised, and explain what goes wrong. [3]

SECTION C · Stretch

- C1** Use the Cayley-Hamilton theorem to write M^4 in the form $aM + bI$, and state a and b . [4]