
MA3201 - PROBLEM SHEET 1

Time and place: Wednesday 8th September 14¹⁵ – 16⁰⁰ in F6.

If there is some time left after having done the problems, we continue with the lectures.

Page	Exercise number
173–4	1, 2, 5, 6, 7

Problem 1.

- (a) What is the centre of $M_2(\mathbb{R})$?
- (b) Show that \mathbb{H} is a subring of $M_2(\mathbb{C})$.
- (b) What is the centre of $\mathbb{H} = \left\{ \begin{pmatrix} a & b \\ -\bar{b} & \bar{a} \end{pmatrix} \mid a, b \in \mathbb{C} \right\}$?

Problem 2. Show that the following sets are subrings of $M_2(\mathbb{R})$. Which of them are commutative?

- (i) $\left\{ \begin{pmatrix} a & b \\ -b & a \end{pmatrix} \mid a, b \in \mathbb{R} \right\}$.
- (ii) $\begin{pmatrix} \mathbb{R} & 0 \\ \mathbb{R} & \mathbb{Z} \end{pmatrix}$.
- (iii) $\left\{ \begin{pmatrix} a & a-b \\ 0 & b \end{pmatrix} \mid a, b \in \mathbb{R} \right\}$.

Challenge: Find all the left ideals in the ring $R = \begin{pmatrix} \mathbb{Q} & \mathbb{Q} \\ 0 & \mathbb{Z} \end{pmatrix}$.