
MA3201 - PROBLEM SHEET 5

FALL 2009

Date and place: Tuesday, October 27 in F3.

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Problem 1. Let R be a ring and $\phi: \text{End}_R(R)^{\text{op}} \rightarrow R$ be defined by $\phi(g^{\text{op}}) = g(1)$, where $g \in \text{End}_R(R)$. Show that ϕ is a ring isomorphism.

Problem 2. Let R be a ring and M, N R -modules. Let $\phi: M \rightarrow N$ be an R -module isomorphism. Show that the map $\phi^*: \text{End}_R(M) \rightarrow \text{End}_R(N)$ given by $\phi^*(f) = \phi f \phi^{-1}$ for $f \in \text{End}_R(M)$ is a ring isomorphism.

Problem 3. Let R be a ring. Show that $M_n(R)^{\text{op}} \simeq M_n(R^{\text{op}})$.

Problem 4. Let $R = \mathbb{Z}_2G$, where G is a group of order 2. Show that R is not a semisimple ring.

Problem 5. Let Q be the quiver

$$1 \longrightarrow 2 \longrightarrow 3$$

and F be a field. Find a nilpotent ideal I in the path algebra FQ such that FQ/I is a semisimple ring.

Problem 6. Problem 1 from the exam of December 2007.

Problem 7. Problem 2 from the exam of December 2007.