MATH 5590H BONUS

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Exercise. *Prove that if R is Noetherian, then R/I is Noetherian for any ideal I of R.*

Proof. Let R be Noetherian. Then for any ascending chain of ideals

$$I_1 \subset I_2 \subset I_3 \subset \cdots,$$

there exists $n \in \mathbb{N}$ s.t. $\forall i \geq n\ I_i = I_{i+1}$. Then suppose R/I is not Noetherian. Then $\exists$ an ascending chain of ideals

$$J_1 \subset J_2 \subset J_3 \subset \cdots,$$

s.t. $J_i \neq J_j\ \forall i \neq j$. □

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