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Title: Adjoint preenvelopes and precovers of modules

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Let $\mathcal{C}$ be a class of left R -modules and $(-)^+ = \text{Hom}_{\mathbb{Z}}(-, \mathbb{Q}/\mathbb{Z})$, where $\mathbb{Z}$ is the ring of integers and $\mathbb{Q}$ is the ring of rational numbers. A left R -module homomorphism $M \rightarrow N$ is said to be a $\mathcal{C}$ -adjoint preenvelope of M if $N \in \mathcal{C}$ and the sequence $0 \rightarrow C^+ \otimes M \rightarrow C^+ \otimes N$ is exact for any $C \in \mathcal{C}$. $M \rightarrow N$ is called a $\mathcal{C}$ -adjoint precover of N if $M \in \mathcal{C}$ and the sequence $0 \rightarrow N^+ \otimes C \rightarrow M^+ \otimes C$ is exact for any $C \in \mathcal{C}$. We investigate the existence and properties of adjoint preenvelopes and adjoint precovers. The relationships among adjoint preenvelopes, adjoint precovers, preenvelopes and precovers are obtained. As a consequence, we characterize several important rings in terms of adjoint preenvelopes and adjoint precovers.

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