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Radicals, torsion theories, and closure operations on ideals and submodules.

Radicals and torsion theories are important tools for studying rings and their modules. We show that both are equivalent to certain functorial closure operations on submodules, and, furthermore, any "cohereditary" radical is completely determined by the closure operation it induces on left ideals. This allows us to prove the equivalence of the following categories, for any ring R: (1) the category of all cohereditary radicals on the category of left R-modules; (2) the category of all closure operations on submodules of left R-modules that are "minimal," in a certain sense; and (3) the poset of all "semiprime" closure operations on the left ideals of R. These equivalences allow one to treat the theory of closure operations on ideals within the theory of radicals. (Received January 05, 2017)