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Modules over many rings

Abstract

If M is a module over a ring R then "essentially the same module" may be found over the ring $M_2(R)$ of 2×2 matrices over R. The underlying set, $M \oplus M$, is different, though directly constructed from M, and the module M with the original action of R is easily found within this second module. Beyond this kind of example (Morita equivalence) there are other ways in which "essentially the same module" may be found over different rings. Understanding this suggests an alternative definition of what a module is; namely that it is an exact functor on a small abelian category. I will explain this and give some examples.