Additional Definitions from PS

A ring R is simple if it is non-trivial and only two-sided ideals are {0}, R

- when R is commutative, simple is equivalent to being a field

centre of R: $Z(R) := \{x : xy = yx \text{ for all } y\}$

idempotent element: e in R is idempotent if $e^2=e$, $er = re$ for all r (central idempotent)

primitive idempotent element: non-zero idempotent element e is primitive if for any e′, $e'e = 0$ or $e'e = e$.
indecomposable ring: if there is no idempotent element other than 0, 1

Endomorphism ring of M: $End_R(M) := \{f : M \to M : f \text{ is R-module homomorphism}\}$

- addition: pointwise
- multiplication: composition
- 0: 0 function, $f(r) \equiv 0$
- 1: id function.

automorphism group $Aut_R(M)$: group of units of $End_R(M)$

cyclic R-module: R-module generated by one element.
simple R-module: no R-submodule other than 0, M