

Def. Let  $\phi: G \rightarrow G'$  be a homomorphism such that  $\phi$  is one-to-one and onto then  $\phi$  is called an isomorphism and we say that  $G$  is isomorphic to  $G'$  written as  $G \cong G'$ .

— if  $\phi$  from  $G$  onto itself ~~then~~ is an isomorphism then  $\phi$  is called an automorphism.

## Matrix Groups:

Def. The set of all non-singular matrices denoted by  $n \times n$

$$GL(n, \mathbb{C}) = \left\{ A = (a_{ij})_{n \times n} \mid a_{ij} \in \mathbb{C}, 1 \leq i, j \leq n, \det A \neq 0 \right\}$$

form a group. called General linear group.

with matrix multiplication i.e.  $(GL(n, \mathbb{C}), \cdot)$  where  $\cdot$  is the usual multiplication of matrices.

—  $GL(n, \mathbb{R})$  is also called general linear group where matrices have entries from the real numbers  $\mathbb{R}$   
note that  $GL(n, \mathbb{R}) \leq GL(n, \mathbb{C})$ .