Def: Let $\phi: G \to G'$ be a homomorphism, define Kernel of ϕ by: $Ker(\phi) = \{x \in G \mid \phi(x) = e'\}$ where e' is the identity of the group G'.

Remark: – $e \in Ker(\phi)$ since $\phi(e) = e'$.

– $Ker(\phi) = g^{-1} * Ker(\phi) * g$, $\forall g \in G$, where $(G, *)$ is the group of the domain of ϕ. (check!)

Def: Let $N < G$ then N is called normal subgroup if $g^{-1} N g = N$, $\forall g \in G$ and enoted by $N \trianglelefteq G$

– if N is proper normal we write $N \triangleleft G$

– example $\{e\} \trianglelefteq G$ for any group G. and $G \trianglelefteq G$

– $Ker(\phi) \trianglelefteq G$

Def: The center of a group G denoted by $C(G)$ is the set $C(G) = \{c \in G \mid c * x = x * c, \forall x \in G\}$

– $C(G) \trianglelefteq G$ since, if $g \in G$ and $x \in G$ we have

$$x^{-1} g x = x^{-1} x g = e \cdot g = g \in C(G).$$