Odd / Even Permutation + Sign, Transposition

Inversion

Morphisms :- $\sim : S \to T$, $\sim \subset S \times T$, $(a,b) \in \sim \iff a \sim b$

$f : S \to T$, $f \subset S \times T$, $\forall s \in S$, $\exists$ unique $t \in T$ s.t $(s,t) \in f \iff f(s) = t \iff s \mapsto t$

$f : G \to H$, f is a function, s.t $f(ab) = f(a) \cdot f(b)$, $f(1) = 1$

Group Homomorphism

$(R,+) \mapsto (S,+)$

$f : R \to S$, f is a group homomorphism, $f(ab) = f(a) f(b)$, $f(1) = 1$

Ring homomorphism

Defn :- $\varphi : G \to H$ is a group homomorphism iff

$$\varphi(gh) = \varphi(g) \cdot \varphi(h)$$

Note that $\varphi(1) = 1$

$f : S \to T$

Defn :- A bijective group homomorphism is called isomorphism

$\varphi : G \to H$

$a \in G$, $|a| = n$, $|\varphi(a)| = n$