Sylow Theorems

Cauchy's theorem for Abelian Groups

Let G be a finite abelian group and a prime $p | o(G)$ then there exists an element $a \neq e$ in G such that $o(a) = p$

Sylow p- Subgroups

Let $o(G) = p^m n$, where p is the prime and m, n the positive integers such that $p \nmid n$. Then a Subgroup H of G is said to be a Sylow p- Subgroup of G, if $o(H) = p^m$ and $o(H)$ is the ~~height~~ ~~hei~~ highest power of p that divides $o(G)$

Sylow's first theorem — Let G be a finite Group such that $p^m | o(G)$ and $p^{m+1} \nmid o(G)$ where P is a prime number and m is a positive integer. Then G has subgroups of Order $p, p^2, p^3, \ldots, p^m$.

Sylow's Second theorem — Let G be a finite group and p be a prime number such that $P | o(G)$. Then, any two Sylow p- Subgroups of G are conjugate.

Theorem Let $P | o(G)$, where G is a finite Group and p is any prime number. Then a Sylow p Subgroup H of G is normal, if H is unique Sylow p- Subgroup of G.

Sylow's third theorem

The number of Sylow p- Subgroup in G for a Given prime p is of the form $1 + Kp$ where K is some non- negative integer and $(1+Kp) | o(G)$