Aswer No 1

A set G with a binary operation $*$ is an abelian group if all these hold:

1. closure: For all $a, b \in G$, $a * b \in G$
2. Associativity: For all $a, b, c \in G$, $(a*b)*c = a*(b*c)$
3. Identity Element: There exist $e \in G$ such that $a*e = e*a$ for all $a \in G$
4. Inverse Element: For all $a \in G$, there exist $b \in G$ such that $a*b = b*a = e$.
5. Commutativity: For all $a, b \in G$, $a*b - b*a$

Define ~~an~~ the set and operation

Set $O = \{\cdots, -5, -3, -1, 1, 3, \cdots\}$

operation $= +$ (usual addition)

① closure under +:

Sum of two odd numbers:

$$(2m+1)+(2n+1)=2(m+n+1)$$

this is even, closure fails

② Associativity:

Addition of integers is associative:

$$(a+b)+c=a+(b+c)$$

③ Identity element:

The identity element for addition is 0

$$a+0=0$$

0 is even, not odd

No identity element in the set of odd numbers

④ Inverse Element:

Inverse of a under addition is $-a$

$-a$ is odd if a is odd

5. Commutativity:

Addition is commutative : $a+b = b+a$

So, (Odd numbers, $+$) is NOT an abelian group.