First number theory set

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Lemma 1 *Let $a, b, c \in \mathbb{N}$*

1. *if $a|b$ and $b|c$, then $a|c$.*

2. *If $a|c$ and $b|d$, then $ab|cd$.*

3. *If $a|b$ and $a|c$ then $a|b + c$.*

4. *If $a \neq 0$ and $c \neq 0$ $ac|bc$, then $a|b$.*

Lemma 2   1. *The sum of two odd numbers is even.*

2. *the sum of two consecutive numbers is odd*

3. *the product of two consecutive numbers is even.*

Lemma 3   1. *$\forall n \in \mathbb{N}, 2|(n * n + n)$.*

2. *$\forall n \in \mathbb{N}$, the sum of the first n numbers equals $n(n-1)/2$.*

3. *$\forall n \in \mathbb{N}$, he sum of the first n odd numbers equals n^2.*

4. *$\forall n \in \mathbb{N}, 2|(3^n - 1)$.*