Q4: if $((a+b)^n - b^n)$ we can be written as:

$$\Rightarrow a \mid \left(\sum_{m \geq 0}^{n} \binom{n}{m} a^{n-m} b^m - b^m \right) \quad (\text{any } n, m \in \mathbb{Z})$$

$$\Rightarrow a \mid \left(a^n + \binom{n}{1} a^{n-1} b + \binom{n}{2} a^{n-2} b^2 \ldots \binom{n}{n-1} a^1 b^{n-1} + b^n - b^n \right)$$

$$\Rightarrow a \mid \left(\binom{n}{1} a^n + \binom{n}{1} a^{n-1} b + \binom{n}{2} a^{n-2} b^2 \ldots \binom{n}{n-1} a^1 b^{n-1} \right)$$

$\Rightarrow a \mid a^1($

- we can take a out of every term in the summation

$$\Rightarrow a \mid a\left(a^{n-1} + \binom{n}{1} a^{n-2} b + \binom{n}{2} a^{n-3} b^n \ldots \binom{n}{n-1} b^{n-1} \right)$$

$$\Rightarrow ak = a\left(\sum_{m=1}^{n-1} \binom{n-1}{m} a^{n-1-m} b^m \right) \leftarrow \text{Some integer } K$$

$$k = \sum_{m=1}^{n-1} \binom{n-1}{m} a^{n-1-m} b^m$$

- Since the summation is an integer, K will be equal to it. This means that a will be able to divide it!