4. For a natural number $n > 1$, prove that all $\boxed{\text{prime factors}}$ of $n! + 1$ must be greater than n.

proof: Let $n \in \mathbb{N}$. $n > 1$.

Let $p \in \mathbb{N}$. p is a prime number and $p \mid n!+1$.

Assume the contradiction: There is a p that $p \leq n$.

Since p is a factor of $n!+1$, gives, $p \mid n!+1$.

Considering the factorial $n!$, which.

$$n! = n \cdot (n-1) \cdot (n-2) \cdot (n-3) \cdots\cdots 3 \cdot 2 \cdot 1$$

Since $p \leq n$ and p is a prime number, and $n \in \mathbb{N}$. gives. p must be equal to one of the number in $[2, n)$

Thus. we can rewrite the $n!$ as a product of two parts. which.

$$n! = (1 \times 2 \times \cdots\cdots \times p) \times ((p+1) \times \cdots\cdots \times n)\text{, which gives } p \mid n!$$

Since $p \mid n!$ and $p \mid n!+1$, from the division of integer linear combination. gives.

$$p \mid [t(n!+1) + sn!]\text{, where } s \in \mathbb{Z}.\ t \in \mathbb{Z}.$$

Take $t = 1$ and $s = -1$. gives. $p \mid [(n!+1) - n!]$, which $p \mid 1$

However. since $p \in \mathbb{N}$. p is a prime number, gives $p > 1$. contradicts to $p \mid 1$.

Therefore, I've proved that for a natural number $n > 1$, all prime factors of $n!+1$ must be greater than n.

$\blacksquare$