Continuing this proof

Let $n \geq 2$ and assume $P(k)$ true for all $k = 1, 2, \ldots, n$.

We wish to infer that $P(n+1)$ is true.

Since $n \geq 2$, then $n + 1 \geq 3$.

Hence, by the definition of F:

$$F(n+1) = F(n-1)$$

But $n - 1 \leq n$ and so by the Inductive Hypothesis,

$$F(n-1) = n - 1 \mod 2$$

Also note that

$$n - 1 \mod 2 = n + 1 \mod 2$$

Hence

$$F(n+1) = n + 1 \mod 2$$