Consider the sequence $a_1 = 5$, $a_2 = 13$, and $a_{n+2} = 5 \cdot a_{n+1} - 6 \cdot a_n$.

Prove using the method of smallest counterexamples that for all $n \in \mathbb{N}$, $a_n = 2^n + 3^n$. 