Let plus minus switcher function if a is even then:,

Else:

Where is expression in brackets of this n-th term of this form where

And we can rewrite formula:

The proof of this formula is that the discrete derivative of each new term starting from the second cancels each term starting from the second from the resulting discrete derivative of the first term.  
This can be formally written, but writing this proof is very tedious and will take a lot of time. So I will leave this formula without proof for now