

I.5 Fibonacci Sequence and Catalan's identity

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1 Conclusions

$$F_n^2 - F_{n+r}F_{n-r} = (-1)^{n-r}F_r^2,$$

$$F_n^2 - F_{n-1}F_{n+1} = (-1)^{n-1}.$$

To test this identity, I began by creating two functions. The first generated a list containing the Fibonacci sequence dependant on user input of the first, second, and amount of terms to be stored. The second simply took Catalan's identity and utilized elements of the Fibonacci list. Originally I tested the Fibonacci sequence for the top equation including r . Afterwards I created another function that uses the second equation above. Based on the lists my function produced, I came to the conclusion that the identity of Cassini will hold when the first terms of the Fibonacci sequence are 1 and 1.

I concluded that the identity of the first equation holds for any amount of list elements in the Fibonacci generator, so long as the first and second terms are 0 and 1. Another caveat I did find was that in order for the identity to hold, n must be greater than r , so really this means that the identity does not hold true for *all* terms, after changing the variables of the Fibonacci generator. Initially I hypothesized that the identity would work, and after several manipulations of the operators and subscripts/superscripts, I was unable to determine an identity that would properly function regardless of the first and second terms.