

# Fibonacci Project

Math 262

due Monday, February 19

Let  $F_0 = 0$ ,  $F_1 = 1$ , and  $F_n = F_{n-1} + F_{n-2}$  for integers  $n > 1$ . Your task is to create a Mathematica notebook that provides convincing evidence that the following identities hold.

**1. Catalan's Identity:**

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

Note that the left side is almost the same as that of Cassini's identity, except that 1 has been replaced by  $r$ . *What values of  $r$  make sense for this identity?*

**2. Vajda's Identity:**

$$F_{n+i}F_{n+j} - F_nF_{n+i+j} = (-1)^nF_iF_j$$

*What values make sense for  $i$  and  $j$ ?*

Your Mathematica notebook should indicate not only what you computed, but also how well you understand what you did. A list of calculations with no reasoning will not suffice. Your goal should be to communicate your solution to another person (e.g., another student at your level who is not in this course).

Only submit code that actually runs. If you can't get something complicated to work, try something simpler. It's better to turn in an incomplete assignment that runs instead of a "complete" assignment that doesn't run.

Your notebook will be graded on a scale of 0 to 4, according to the following rubric.

- 4.** Problems and goals are clearly stated, including relevant definitions or parameters. Computations are complete; code runs and is clearly explained. Conclusions are clearly stated. Limitations of the methodology, extensions for future work, and/or conjectures are discussed. Notebook is well-formatted and easy to read.
- 3.** Problems and goals are stated well, though relevant definitions or parameters may be missing. Computations are mostly complete; code runs, but explanation is weak. Conclusions are unclear or not well justified. Insufficient discussion of limitations, extensions, and/or conjectures.
- 2.** Statement of problem or goal is unclear. Computations are incomplete; explanation is ambiguous. Code may produce errors when run. Conclusions are possibly correct, but not justified. Little or no discussion of limitations, extensions, and/or conjectures. Notebook is difficult to read.
- 1.** Serious misunderstanding of the problem or goal. Computation is inadequate for the task at hand. Work is not clearly explained. No discussion of limitations, extensions, and/or conjectures. Notebook is difficult to read.
- 0.** Notebook is not turned in.