# Problem set 11: recurrence relations

Let *Fn* be the nth Fibonacci number. (Let us assume that F1 = F2 = 1.)

1. Using induction prove that, for all nN, $1+\sum\_{k=1}^{n}F\_{k}=F\_{n+2}$
2. Using induction prove that, for all nN, $F\_{n-1}F\_{n+1}=(F\_{n})^{2} +(-1)^{n}$
3. Find a formula for the sum of the first n odd-index Fibonacci numbers (F1, F3, F5, ...). Prove your conjecture.
4. Find a formula for the sum of the first n even-index Fibonacci numbers (F2, F4, ...). Prove your conjecture.
5. Prove that $F\_{n+3}=2F\_{n+1}+F\_{2}F\_{n}$
6. Find a recurrence formula that defines the sequence 2, 5, 8, 11, 14, ...
7. Find a closed form expression for each of the following sequences:
8. 1, -3, 9, -27, 81, ...
9. -6, -1, 4, 9, 14, ...
10. 1, 8, 27, 64, 125, ...
11. Find a closed form expression for the sequence: a0 = 8, an = an-1 – 4



*Fibonacci spiral*

*Mathematicians have tried in vain to this day to discover some order in the sequence of prime numbers, and we have reason to believe that it is a mystery into which the human mind will never penetrate.*

 - Leohard Euler (1707-1783)

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