

[6.24] Fast Fibonacci Numbers

The Fibonacci numbers are defined by this recurrence relation:

$$F_1 = 1, \quad F_2 = 1, \quad F_{n+2} = F_n + F_{n+1}$$

This formula can be used to find the n th Fibonacci number:

$$F_n = \frac{1}{\sqrt{5}} \left[\left(\frac{1+\sqrt{5}}{2} \right)^n - \left(\frac{1-\sqrt{5}}{2} \right)^n \right]$$

However, the 89/92+ cannot use this formula for large n , because the CAS cannot simplify the result. Finding the numbers with a TI Basic program in recursion is quite slow, and limits n to about 255. However, this function can find Fibonacci numbers for large n :

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Define fib(n)=[[1,1][1,0]]^(n-1)[1,1]
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(Credit to Alex Astashyn)