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3. Calvin T. Long, "Arrays of Binomial Coefficients whose Products are Squares," Fibonacci Quarterly, Vol. 11, No. 5 (Dec. 1973), pp. 449-456.
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that

$$F_{8\cdot 3^{n-1}} \equiv 3^n \pmod{3^{n+1}}$$

$$F_{8\cdot 3^{n-1}-1} \equiv 1 + 3^n \pmod{3^{n+1}} .$$

Therefore

$$F_{8\cdot 3^{n-1}+x} \equiv F_x + 3^n(F_x + F_{x+1}) \pmod{3^{n+1}} .$$

If x satisfies (*), then either x or $8\cdot 3^{n-1} + x$ or $16\cdot 3^{n-1} + x$ will be congruent to m modulo 3^{n+1}. Therefore (*) has solutions for arbitrarily large n.

Problem 2. The number N is said to have complete Fibonacci residues if there exists a solution to the congruence

$$F_x \equiv m \pmod{N}$$

for all integers m. A computer search shows that the only values of $N \le 500$ having complete Fibonacci residues are the divisors of

$$3^5,\quad 2^2\cdot 5^3,\quad 2\cdot 3\cdot 5^3,\quad 5\cdot 3^4,\quad \text{or}\quad 7\cdot 5^3 .$$

Determine all N which have complete Fibonacci residues.

Problem 3 is submitted by the undersigned and Leonard Carlitz, Duke University, Durham, North Carolina.

Problem 3. Show that if $= e^{\pi i/n}$, then

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