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Factoring Generalized Repunits

. Preliminary report.

A *repunit* R_n is an integer written in decimal form as a string of n ones. More than twenty years ago, W. M. Snyder extended the notion of a repunit to one in which for some integer $b > 1$, $R_n(b)$ has a b-adic expansion consisting of only ones; that is, $R_n(b) = \Sigma_{i=1}^{n-1} b^i = \frac{b^n-1}{b-1}$, where $n > 0$. Examples include the Mersenne numbers, $M_n = 2^n - 1 = 1 + 2^1 + 2^2 + \ldots + 2^{n-1}$, for $n \geq 2$. Snyder's admitted objective was to apply algebraic number theory in cyclotomic fields in order to determine the pairs of integers (n, b) under which $R_n(b)$ has a prime divisor congruent to 1 modulo n. Specifically, he proved that $R_n(b)$ *has a prime divisor congruent to* 1 $\pmod{n}$ *if and only if either* $n \neq 2$*, or* $n = 2$ *and* $b \neq 2^e - 1$*, for all* $e > 1$. In this talk, we shall demonstrate how this result follows from theory pertaining to the Lucas sequences. (Received September 22, 2005)