Compositeness Test for Repunit Numbers

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Abstract: Conjectured polynomial time compositeness test for numbers of the form \((10^p - 1)/9\) is introduced.

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1 Introduction

In 2010 Pedro Berrizbeitia, Florian Luca and Ray Melham provided polynomial time compositeness test for numbers of the form \((2^p + 1)/3\), see Theorem 2 in [1]. In this note I present polynomial time compositeness test for numbers of the form \((10^p - 1)/9\) that is similar to the Berrizbeitia-Luca-Melham test.

2 The Main Result

Definition 2.1. Let \(P_m(x) = 2^{-m} \cdot \left( \left(x - \sqrt{x^2 - 4}\right)^m + \left(x + \sqrt{x^2 - 4}\right)^m \right)\), where \(m\) and \(x\) are nonnegative integers.

Conjecture 2.1. Let \(R = (10^p - 1)/9\) such that \(p\) is an odd prime.

Let \(S_i = P_{10}(S_{i-1})\) with \(S_0 = P_5(6)\), thus

If \(R\) is prime then \(S_{p-1} \equiv P_5(6) \pmod{R}\)

References