A bold conjecture about a way in which any prime can be written

Marius Coman
Bucuresti, Romania
email: mariuscoman13@gmail.com

Abstract. In this paper I make a conjecture which states that any prime greater than or equal to 5 can be written in a certain way, in other words that any such prime can be expressed using just two other primes and a power of the number 2.

Conjecture:

Any prime greater than or equal to 5 can be written at least in one way as \((9*p^2 - q^2)/(2^n)\), where \(p\) and \(q\) are primes and \(n\) non-null positive integer.

Verifying the conjecture:
(For the first nine such primes)

- \(5 = (9*7^2 - 11^2)/64\), so \([p, q, n] = [7, 11, 6]\) but also \(5 = (9*7^2 - 19^2)/16\) so \([p, q, n] = [7, 19, 4]\);
- \(7 = (9*5^2 - 13^2)/64\), so \([p, q, n] = [5, 13, 3]\);
- \(11 = (9*5^2 - 7^2)/16\), so \([p, q, n] = [5, 7, 4]\);
- \(13 = (9*5^2 - 11^2)/8\), so \([p, q, n] = [5, 11, 3]\) but also \(13 = (9*7^2 - 5^2)/32\) so \([p, q, n] = [7, 5, 5]\);
- \(17 = (9*7^2 - 13^2)/16\), so \([p, q, n] = [7, 13, 4]\);
- \(19 = (9*7^2 - 17^2)/8\), so \([p, q, n] = [7, 17, 3]\) but also \(19 = (9*13^2 - 37^2)/8\) so \([p, q, n] = [13, 37, 3]\) but also \(19 = (9*17^2 - 13^2)/128\) so \([p, q, n] = [17, 11, 7]\);
- \(23 = (9*13^2 - 7^2)/64\), so \([p, q, n] = [13, 7, 6]\);
- \(31 = (9*11^2 - 29^2)/8\), so \([p, q, n] = [11, 29, 3]\) but also \(31 = (9*13^2 - 23^2)/32\) so \([p, q, n] = [13, 23, 5]\);
- \(37 = (9*23^2 - 5^2)/128\), so \([p, q, n] = [23, 5, 7]\).

Note:
For the prime 29 I didn’t find primes solution \([p, q]\) up to the denominator \(2^{12}\), but surely I conjecture that there exist such solutions.

Note:
For some of the primes we found that they verify also the formula \((9*p^2 - q^4)/(2^n)\).