

VP-criterion of simplicity

Odd natural number $n > 1$ is a prime number if and only if $W_{(n-1)/2}$ divisible by n ,

where W is a recurrence sequence defined by equation

$$W_n - 3 W_{n-1} + 5 W_{n-2} - 7 W_{n-3} + 5 W_{n-4} - 3 W_{n-5} + W_{n-6} = -1$$

with initial members

$$W_0 = 0, W_1 = 6, W_2 = 10, W_3 = 7, W_4 = 6, W_5 = 22.$$

Explicit formula of the sequence W:

$$W_n = Z_n \left((a - 1) a^{n+1} + b c^{n+1} \right) - 2 b d^{n+1} + (e - 1) e^{n+1} + 1,$$

where

$$Z_n = 2 A_n / B_n ;$$

$$A_n = \cos ((n + 1) t) - k \sin ((n + 1) t) ;$$

$$B_n = \cos^{n+1} t ;$$

$$t = \arctan (p / a) ;$$

$$k = p / (a - 1) ;$$

$$p = 3^{1/2} y / 2 ;$$

$$a = - (3 y + 4 v^{-1/3} - 4) / 6 ;$$

$$b = (3 x + 1) / (6 x - 4) ;$$

$$c = b (6 x - 1) / (3 x - 2) ;$$

$$d = (3 x + 1) / 3 ;$$

$$e = - 2 (a - 1) ;$$

$$x = (u^{1/3} - 20 u^{-1/3}) / 6 ;$$

$$y = (v^{1/3} - 4 v^{-1/3}) / 6 ;$$

$$u = 44 + 12 (69^{1/2}) ;$$

$$v = 100 + 12 (69^{1/2}) .$$

With the help of this criterion one can answer the question whether a given number is prime or not. The regularity described above was discovered when studying numeric tables with a size of **10 GB**.

Veselov A.G., Poleshchuk V.J.

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