Title: Primes matrix: Approximation 2 Slug: primesapprox2 Date: 2018-04-05 07:37 Category: Math Tags: primes, number theory Author: Samdney

Since I wasn't happy about the final sum in my last post Primes matrix: Approximation, I think about an alternative way.

We had

$$x_{(a,\ldots,b),kj} = \lim_{m\to\infty}\left(\prod_{i=a}^{b}\exp\left(I2\pi\frac{k-x_i}{2x_i+1}\epsilon\left(m\right)\right)\right)\delta_{kj} = \lim_{m\to\infty}\exp\left(\sum_{i=a}^{b}I2\pi\frac{k-x_i}{2x_i+1}\epsilon\left(m\right)\right)\delta_{kj}$$

in which we made the product over all exp-functions for each x_i. Now, instead we will do the product over the arguments of the exp-functions

$$x_{(a,\ldots,b),kj} == \lim_{m\to\infty}\exp\left(\prod_{i=a}^{b}I2\pi\frac{k-x_i}{2x_i+1}\epsilon\left(m\right)\right)\delta_{kj}$$

Let's look at the qualities of this product

$$\prod_{i=a}^{b}\frac{k-x_i}{2x_i+1}$$

and under which conditions we receive integers. From my work https://github.com/Samdney/primescalc we already know that we get troubles if at least one of the $2x_i+1$ is a divisible number. Hence, we always asume that all our numbers $2x_i+1$ are primes.

We receive integer values in the following cases

- **Case 1:** For all k-values which are also solutions for every single exp-equation.
- **Case 2:** For all k-values which is a solution for at least one single exp-equation and also leads to the trivial solution with $x_{(1),j} = N\left(2x_{(2),i}+1\right)$, $N\in\mathbb{N}$.

For the second case, we take the example of two equations with $x_1 = 2$ and $x_2 = 3$

$$\frac{k-x_1}{2x_1+1}\frac{k-x_2}{2x_2+1} = \frac{(k-2)(k-3)}{5\cdot 7}$$

Here we receive one solution for $k=37$, $\frac{35\cdot 34}{35} = 34$, which is also a solution for $\frac{37-2}{5} = 7$ and an other solution for $k=38$, $\frac{36\cdot 35}{35} = 36$ which is also a solution for $\frac{38-3}{7} = 5$. We see that k leads to the trivial case in which x_j of one single exp-equation is equal to the prime value of an other single exp-equation or the product of primes of several single exp-equations.