

## The distribution of prime numbers – Ryoji Furui on June 28, 2023 @ryoji.info

In this paper, we will attempt to discover exact solutions for prime numbers. Let us make a list of the natural numbers as six functions of  $n$ , where  $n$  is a natural number.

$n$	$2(3n-2)$	$3(2n-1)$	$2(3n-1)$	$6n-1$	$2*3n$	$6n+1$
1	2	3	4	5	6	7
2	8	9	10	11	12	13
3	14	15	16	17	18	19
4	20	21	22	23	24	25
5	26	27	28	29	30	31
6	32	33	34	35	36	37
7	38	39	40	41	42	43
	...					

We state the following three observations about this list.

- 1) The second, third, fourth, and sixth columns contain the factor(s) 2 and/or 3. Hence, the only prime numbers in these columns are 2 and 3.
- 2) As a result of observation 1), all prime numbers except 2 and 3 are in the fifth and seventh columns. Hence, all primes except 2 and 3 can be represented as  $6n-1$  or  $6n+1$ .
- 3) Because all numbers in the fifth and seventh columns never contain the factor 2 or 3, all composite numbers in those columns can be expressed as  $(6a-1)(6b-1)$  or  $(6a-1)(6b+1)$  or  $(6a+1)(6b+1)$ , where  $a$  and  $b$  are natural numbers.

As a result, the prime numbers can be determined as follows:

prime numbers = 2, 3,  $6n-1$ ,  $6n+1$  for  $n = 1, 2, \dots$ , except when  $6n-1$  or  $6n+1 = (6a-1)(6b-1)$  or  $(6a-1)(6b+1)$  or  $(6a+1)(6b+1)$  for  $a, b = 1, 2, \dots$