Title: Formula to get twin prime numbers.
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Abstract: This paper develops a modified an old and well-known expression for calculating and obtaining all twin prime numbers greater than three. The conditioning (n) will be the key to make the formula work.

Keywords: Prime numbers, Twin prime numbers.

Introduction

The study of the twin prime numbers is wonderful and exciting, in the absence of an expression that involves all of them I have investigated and I have discovered a brilliant expression.

This expression comes from investigating first how they are distributed the composite numbers and prime number, this allowed me to explore its order and understand its mechanism. The expression of the twin prime numbers is its result.
The expression to obtain the twin prime numbers is similar to how we use the sieve of Eratosthenes although all that infinite procedure expressed in symbols in a formula.

Methods

The twin prime numbers greater than 3 can be expressed under the expressions $(6 * n + 1)$ and $(6 * n - 1)$, for some values of (n). This paper demonstrates in Theorem 1 how to obtain the correct (n) values to obtain all the prime numbers.

Theorem 1. **Sequence of $\boldsymbol{\beta}$**

$$\boldsymbol{\beta = (6 * n \pm 1)}$$

The $\boldsymbol{\beta}$ sequence will be essential for the development of the final formula.

$n > 0$

Sequence numbers $\beta\ (a)$

$$\beta\ (a) = (6 * \mathrm{n} + 1) = \ 7,13,19,25,31,37,43,49,55,61,67,73,79, \dots$$

Sequence numbers $\beta\ (b)$
$\beta\ (b) = (6 * \mathrm{n} - 1) =\ 5{,}11{,}17{,}23{,}29{,}35, 41{,}47{,}53{,}59{,}65{,}71{,}77{,}83, \dots ....$

$$\boldsymbol{\beta} = (\mathbf{6} * \mathbf{n} \pm \mathbf{1}) = \mathbf{5}, \mathbf{7}, \mathbf{11}, \mathbf{13}, \mathbf{17}, \mathbf{19}, \mathbf{23}, \mathbf{25}, \mathbf{29}, \mathbf{31}, \mathbf{35}, \mathbf{41}, \mathbf{43}, \dots ..$$

Theorem 2. **Natural Twin**

The natural twins play a fundamental role in the application of the formula.
The natural twins are obtained from the $\boldsymbol{\beta}$ sequence, they are numbers that take two of difference. One belongs to the form β (a) and the other to the form β (b)

$$gn_x = (\beta\ (b), \beta\ (a))$$

$gn_x =$ natural twins
$gn_x = \ gn_{1=(5,7)}\ ;\ gn_{2=(11,13)};\ \ gn_{3=(17,19)}\ ;\ gn_{4=(23,25)};\dots\dots\dots\ gn_{\infty} = (\infty - 2, \infty)$
$gn_x = \ gn_{1=1}\ ;\ gn_{2=2};\ \ gn_{3=3}\ ;\ gn_{4=4};\dots\dots\dots\dots gn_{\infty=}{}^{\infty}$

Theorem 3. **Expression to obtain twin numbers**

This formula allows the obtaining of all the Twin prime numbers >3. This formula is armed with the combination of the two main variables of prime numbers. Both formulas come together to condition (n) and obtain the correct values for (n).

This formula does not pretend to demonstrate the infinity of twin prime numbers, it only shows and proves how to obtain them.

$$Tp\ = (6 * n \underset{n \neq \beta \mp g_n + \beta * Z}{\overset{n>0}{}} \pm 1)$$

$\beta = (6 * \mathrm{n} \pm 1) =\ 5{,}7{,}11{,}13{,}17{,}19{,}23{,}25{,}29{,}31{,}35, \dots \dots \dots$

$Z \geq 0$

Tp = twin prime numbers >3

Example, application and demonstration of the formula.
In this example I will calculate all the twin prime numbers greater than 3.

Twin Prime numbers in $\boldsymbol{in\ \beta}$ (a)

$$Tp\ (a) = (6 * n_{\substack{n>0 \\ n\neq\beta\mp g_n+\beta*Z}} + 1)$$

$Z \geq 0$

$First\ step \quad \beta - g_n = Subtract\ in\ the\ numbers\ \beta =$ 5,7,11,13,17,19,23,25 ....
$Second\ step \quad \beta + g_n = Sum\ in\ the\ numbers\ \beta =$ 5,7,11,13,17,19,23,25. . . ..
This process is repeated for each number of β.

$$Tp\ (a) = (6 * n_{\substack{n>0 \\ n\neq5-1+5*Z \\ n\neq5+1+5*Z \\ n\neq7-1+7*Z \\ n\neq7+1+7*Z \\ n\neq11-2+11*Z \\ n\neq11+2+11*Z \\ n\neq13-2+13*Z \\ n\neq13+2+13*Z \\ n\neq17-3+17*Z \\ n\neq17+3+17*Z \\ n\neq19-3+19*Z \\ n\neq19+3+19*Z \\ continue\ \ infinitely}} + 1) = \quad (\boldsymbol{6 * n}_{\substack{n>0 \\ n\neq4+5*Z \\ n\neq6+5*Z \\ n\neq6+7*Z \\ n\neq8+7*Z \\ n\neq9+11*Z \\ n\neq13+11*Z \\ n\neq11+13*Z \\ n\neq15+13*Z \\ n\neq14+17*Z \\ n\neq20+17*Z \\ n\neq16+19*Z \\ n\neq22+19*Z \\ continue\ infinitely}} + \boldsymbol{1}) =$$

$n \neq$ 4,6,8,9,11,13,14,15,16,19,20, … … ….

Using values for $\mathrm{n} =$ 1,2,3,5,7,10,12,17,18,23,25 ....

We get the following Prime Numbers
$Tp\ (a) =$ 7,13,19,31,43,61,73,103,109, … … … .

Twin Prime numbers in $\boldsymbol{in\ \beta}$ (b).

$$Tp\ (b) = (6 * n_{\substack{n>0 \\ n\neq\beta\mp g_n+\beta*Z}} - 1)$$

$$Tp\ (b) = (6 * n_{\substack{n>0 \\ n\neq5-1+5*Z \\ n\neq5+1+5*Z \\ n\neq7-1+7*Z \\ n\neq7+1+7*Z \\ n\neq11-2+11*Z \\ n\neq11+2+11*Z \\ n\neq13-2+13*Z \\ n\neq13+2+13*Z \\ n\neq17-3+17*Z \\ n\neq17+3+17*Z \\ n\neq19-3+19*Z \\ n\neq19+3+19*Z \\ continue\ \ infinitely}} - 1) = \quad (\boldsymbol{6 * n}_{\substack{n>0 \\ n\neq4+5*Z \\ n\neq6+5*Z \\ n\neq6+7*Z \\ n\neq8+7*Z \\ n\neq9+11*Z \\ n\neq13+11*Z \\ n\neq11+13*Z \\ n\neq15+13*Z \\ n\neq14+17*Z \\ n\neq20+17*Z \\ n\neq16+19*Z \\ n\neq22+19*Z \\ continue\ infinitely}} - \boldsymbol{1}) =$$

$n \neq$ 4,6,8,9,11,13,14,15,16,19,20, … … ….

Using correct values for: $n =$ 1,2,3,5,7,10,12,17,18,23,25 ....

We get the following Prime Numbers
$Tp\ (b) = 5,11,17,29,41,59,71,101,107, \ldots \ldots \ldots .$

In the two variables of the formula we obtain the same values for (n)

Theorem 4. <u>Twin prime numbers: Tp=(Tp(b),Tp(a))</u>
From the formula of Theorem 3 we obtain the correct prime numbers to form the pairs of twin prime numbers.

Tp = Twin prime numbers >3

$Tp(a)$ = Twin prime numbers in $\beta\ (a)$ $\quad Tp\ (a) = 7,13,19,31,43,61,73,103,109, \ldots \ldots \ldots.$

$Tp\ (b)$ = Twin prime numbers $in\ \beta\ (b)$ $\quad Tp\ (b) = 5,11,17,29,41,59,71,101,107, \ldots \ldots \ldots.$

$$Tp = (5,7),(11,13),(17,19),(29,31),(41,43),(59,61),(71,73),(101,103), \ldots \ldots ..$$

<u>Reference</u>
$Tp\ (a)$ A006512 The on-line encyclopaedia of integer sequences.
$Tp\ (b)$ A001359 The on-line encyclopaedia of integer sequences.

Graphic table, $Tp = Twin\ prime\ numbers > 3$

Twin Prime					
1	2	3	4	5	6
7	8	9	10	11	12
13	14	15	16	17	18
19	20	21	22	23	24
25	26	27	28	29	30
31	32	33	34	35	36
37	38	39	40	41	42
43	44	45	46	47	48
49	50	51	52	53	54
55	56	57	58	59	60
61	62	63	64	65	66
67	68	69	70	71	72
73	74	75	76	77	78
79	80	81	82	83	84
85	86	87	88	89	90
91	92	93	94	95	96
97	98	99	100	101	102
103	104	105	106	107	108
109	110	111	112	113	114
115	116	117	118	119	120
121	122	123	124	125	126

Twin Prime
Prime Number
Composite Number

Conclusion

The order of the twin prime numbers is done by combining the β numbers and the natural twins.
These wonderful formulas under their conditioning generate what has been sought throughout history. For the first time we can find a expression that generates absolutely all the Twin Prime numbers greater than three.
These formula is simple and easy although extensive, and infinity. Understanding the behavior of (n) is equivalent to understanding how twin prime numbers are distributed.

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