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Erratum to "Solutions of Indefinite Equations", [Advances in Pure Mathematics Vol. 10, No. 9, (2020) 540-544]

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Abstract

The original online version of this article (Zengyong Liang (2020) Solutions of Indefinite Equations, Volume 10(9), 540-544, doi: https://doi.org/10.4236/apm.2020.109033) unfortunately contains some mistakes. The author wishes to correct the errors. Sections 5, 6, 7, and 8 are supplemented here.

Keywords

L-Algorithm

5. L-Algorithm

The specific steps of the L-algorithm (three-step method) are as follows:

1) First, find out the original equation model which is lower than the original equation (or a new equation is formed by the sum value $L(f)$ of the left term of the equation, and the unknown number of the equation is set to a smaller value), as shown in the following equation: $L(f) = w$.

For example, suppose the original equation has three terms:

$$a^x + b^y = c^u, \tag{21}$$

then $L(f) = a^x + b^y = w$.

Then:

$$\left(a^x + b^y\right) w^{xy} = w w^{xy} \tag{22}$$

Now, we can determine $a = aw^y$, $b = bw^x$, $c = w$.

6. Higher Order Indefinite Equation with Coefficients

Suppose there is a problem, find:

$$ka^5 + hb^4 = c^3 \tag{23}$$

L-algorithm is also used, for example: $k = 3$, $h = 5$. Let $a = 3$, $b = 5$, then $w = 3854$, $w^{xy} = 3854^{20}$, $a = 3854^4 \times 3$, $b = 3854^5 \times 5$, $c = 3854^7$.

Generally, there is:

$$k_1 a^x + k_2 b^y + k_3 c^z = k_4 d^u \tag{24}$$

Obviously, u and x, y, z are mutually prime, and there is a solution using the L-algorithm using this method flexibly, more types of higher-order indefinite equations can be solved.

7. Determination of Non Solution of Indefinite Equation

Example: To prove that no odd perfect number.

Proof. The condition of even perfect number is that $2^{i+1} - 1$ is prime. The structural equation of perfect number is derived $2^{i+1} - 1 = p$, and $2^i(2^{i+1} - 1)$ is perfect number.

If there is odd prefect number, $o(n) = sn$. Let $1 + q + \ldots + q^i = p$, p is odd.

Because:

$$1 + q + \ldots + q^i + p + p(q + \ldots + q^i) = sp \tag{25}$$

s does not contain factors of q, q^2, … , q^i, then solution of (25) does not satisfy the requirement of perfect number. In addition,

1) If the q is not 2, $p(1 + 1 + q + q^2 + \ldots + q^i)$ can't be factor on the left.

2) If the equation is not like (25), then this equation may not be established.

In any case, there is that no odd perfect number.

8. Analysis and Discussion

Birch and Swinnerton-Dyer Conjecture

Birch and Swinnerton-Dyer conjectured: "mathematicians are always fascinated by the characterization of all integer solutions of algebraic equations such as $x^2 + y^2 = Z^2$. Euclid once gave a complete solution to this equation, but for more complex equations, it becomes extremely difficult [7]." Now, we have been able to find all integer solutions to equation of the form $a^x + b^y = c^z$. Then, we solve the problem of conjecture proposed by Birch and Swinnerton-Dyer. At the same time, we have added a new way to solve the indefinite equations for number theory.

9. Conclusion

References

[7] Baike (n.d.) Seven Mathematical Problems in the World. https://baike.so.com/doc/6659451-6873272.html