

Review to the paper “Ms_JAMCS_42882”

In this paper, quadratic forms in four variables over the field are sorted first of all with respect to permutation symmetry. Thereafter it is shown that any such form is equivalent to one of seven such canonical forms. The orthogonal group of each one of these seven forms is obtained. The paper closes with some remarks about quadratic forms in three variables. I believe that the results obtained in this manuscript are right. But I think it is very hard for readers to understand. So, I advise that the authors should try to make their paper readable, clear and organized. There are some details for the authors to consider.

1. It does not have detailed explanation about some symbols such as $GL(n, \mathbb{C})$, $GL(n, \mathbb{R})$ in the introduction.
2. There are some concepts introduced before the main results, some of them are not clear. For example, the radical of a quadratic form.
3. For the conclusion of the third section, it should be explained. Such as: in the 3.1 section, $a = 1, b = 0, c = 0, d = 0, e = 0, f = 1, g = 1, h = 0, i = 0, j = 0, k = 1, m = 0, n = 0, p = 0, q = 0, r = 1 \Rightarrow 2 \sim 4$.
4. In the 4.1 section, the orthogonal group of $x^2 + xy + y^2$ is the semi-direct product $(S_3 \times S_3) \triangleright (\mathbb{Z}_2 \oplus \mathbb{Z}_2 \oplus \mathbb{Z}_2)$ and has order $36 \times 16 = 576$. Can this conclusion be proved ?
5. In the 4.6 section, how does matrix A, B, C, D, E, F, G, H, J come from ?
6. The proof process of theorem 5.1 can be explained briefly.
7. What is the difference between this paper and the ninth references ?
8. Study the practical significance of the problem, otherwise lengthening variables can get a series of cumbersome results.
9. Can you give an example of the conclusion of this article ?