Problem 1 (due Monday, March 1)

We say that a vector in $\mbox{mathbb } R^3$ is $\{\mbox{vn positive}\$ ($\{\mbox{vn positive}\)$ if all its coordinates are positive (resp. negative). Let v_1,v_2,v_3,v_4 be vectors in $\mbox{vn athbb} R^3$ such that the sum of any two of these vectors is either positive or negative. Prove that at least one of the vectors $v_1,v_2,v_3,v_4,v_1+v_2+v_3+v_4$ is either positive or negative or negative.

The problem was solved by Chris Eppolito, Yuqiao Huang, Ashton Keith, Maxwell T Meyers, and Wei Yang. One solver provided an (almost complete) solution in which it was observed that for vectors in $\mbox{mathbb } R^3$ actually one of the vectors v_1, v_2, v_3, v_4 is either positive or negative. The other solvers provided complete solutions which work for vectors in $\mbox{mathbb } R^n$ for any n. Detailed solutions are discussed in the following link Solution.

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