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# Quasiconvex or quasimonotone families with applications to sums and quasiconvex optimization

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### Abstract

It is well-known that the sum of two quasiconvex functions is not quasiconvex in general, and the same occurs with the minimum. Although apparently these two statements (for the sum or minimum) have nothing in common, they are related, as we show in this paper. To develop our study, the notion of quasiconvex family is introduced, and we establish various characterizations of such a concept: one of them being the quasiconvexity of the pointwise infimum of arbitrary translations of quasi-convex functions in the family; another is the convexity of the union of any two of their sublevel sets; a third one is the quasiconvexity of the sum of the quasiconvex functions, composed with arbitrary nondecreasing functions. As a by-product, any of the aforementioned characterizations, besides providing quasiconvexity of the sum, also implies the semistrict quasiconvexity of the sum if every function in the family has the same property.

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## References

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