Negativity and contextuality are equivalent notions of nonclassicality ROBERT SPEKKENS, Perimeter Institute for Theoretical Physics — An important problem in the foundations of quantum theory is the identification of the precise manner in which quantum theories differ from their classical counterparts. Two notions of nonclassicality that have been investigated intensively are: (1) negativity, that is, the necessity of negative values in real-valued representations of quantum states such as the Wigner representation, and (2) contextuality, that is, the impossibility of a hidden variable model of quantum theory wherein the representation of measurements is noncontextual (also known as the Bell-Kochen-Specker theorem). We shall argue for a particular way of generalizing and making precise both of these notions. With the refined versions of each in hand, it becomes apparent that they are in fact one and the same notion of nonclassicality. It follows that any proof of contextuality is also a proof of negativity and vice-versa.

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