Quantum Contextuality and Einsteinian Realism BRIAN LA COUR, University of Texas at Austin — Contextuality is a phenomenon predicted to be exhibited by quantum systems and at variance with Einsteinian realism, which is said to be noncontextual. The Kochen-Specker theorem, and its many variants, purports to prove this inconsistency. Recently, the question has been put to experiment [e.g., Hasegawa et al., PRL 97, 230401 (2006)], and the findings are consistent with quantum theoretic predictions. I will argue that, in fact, there is no such inconsistency. Specifically, a proof is offered which demonstrates that quantum mechanics is consistent with a noncontextual hidden variable theory, thus refuting the Kochen-Specker theorem. (For simplicity, the proof is restricted to a four-dimensional Hilbert space but is expected to generalize.) The key to the proof is the recognition of a subtle but fundamentally important assumption regarding the dependence of the hidden variable probability distribution on the particular set of mutually commuting observables chosen for measurement.

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