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The Inverse Eigenvalue Problem in Quantum Mechanics MARTIN WILNER, University of Massachusetts at Lowell, emeritus — For a given observable A, its eigenvalues, eigenstates regarded as a basis, and any superposition of such eigenstates, two analytic methods are presented for constructing in closed form the matrix representation of an observable B of which the given superposition is an eigenstate. One method works directly from the eigenvalue condition, but solves first for the matrix elements of B and then for its eigenvalues. The other uses on the diagonal matrix representing A the inverse of the unitary transformation which would diagonalize B. For the two-level system two commuting matrices are obtained with different eigenvalue spectra. For the three-level system the inverse unitary transform yields a continuous infinity of non-commuting matrices, all with the same eigenvalue spectrum, whereas the other method yields a matrix which is none of these: it does not commute with any of them, and its eigenvalue spectrum is different from theirs.

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