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Twice Differentiable Spectral Functions

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Abstract A function F on the space of n -by- n real symmetric matrices is called *spectral* if it depends only on the eigenvalues of its argument. Spectral functions are just symmetric functions of the eigenvalues. We show that a spectral function is twice (continuously) differentiable at a matrix if and only if the corresponding symmetric function is twice (continuously) differentiable at the vector of eigenvalues. We give a concise and usable formula for the Hessian.