Some Remarks on the Nonnegative
Quantum - Mechanical Distribution Function

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Abstract

Distribution functions of Wigner type appear in many physical problems, even in relativistic quantum mechanics. The Wigner distribution function is real, but becouse it can take on negative values, cannot be interpreted as a probability density function.

In this note we examine the conditions for the uniqueness and some properties for a nonnegative quantum - mechanical distribution function. Especially we study the following distribution

$$F_S(q, p, a, t) = \exp\left\{\frac{a}{4}\frac{\partial^2}{\partial q^2} + \frac{\hbar^2}{4a}\frac{\partial^2}{\partial p^2}\right\}F(q, p, t)$$

where $F(q, p, t)$ is the usual one of Wigner.