The Phase-Amplitude (PhA) representation of a wave function

GEORGE RAWITSCHER, University of Connecticut — The PhA representation of an oscillatory wave function is $\psi(r) = y \, \sin(\phi)$, where $y(r)$ is the amplitude and $\phi(r)$ the phase. Since these quantities depend on distance r slowly and generally monotonically, they can be calculated numerically out to large distances with a relatively small number of mesh-points. A linear equation for y^2 exists that has been overlooked in the past. The advantage of this equation is that it avoids the non-linearity difficulties encountered with the equation for y given In 1930 W. E. Milne. This equation will be shown and a solution method will be described, that uses expansions into Laguerre polynomials. A numerical example for the Coulomb potential will be presented, including the region of turning points.

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