

175(8): Particle a a Ring Anti-Commutator

In note 175(7) it was shown that the anti-commutator plays a fundamental role in quantum mechanics. So for the particle a ring the computational research is to work out:

$$1) \left\{ x, \frac{d}{dx} \right\} \psi = x \frac{d\psi}{dx} + \frac{d}{dx} (x\psi) = 2 \frac{d\psi}{dx} + \psi$$

where $\psi = \left(\frac{1}{2\pi} \right)^{1/2} \left(\exp(im_s \phi) + \exp(-im_s \phi) \right)$

where: $\phi = \cos^{-1} \frac{x}{(x^2 + y^2)^{1/2}} = \sin^{-1} \frac{y}{(x^2 + y^2)^{1/2}}$

Similarly:

$$2) \left\{ x, \frac{d}{dy} \right\} \psi = x \frac{d\psi}{dy} + \frac{d}{dy} (x\psi) = x \frac{d\psi}{dy} + \left(\frac{dx}{dy} \right) \psi + x \frac{d\psi}{dy}$$

$$= 2x \frac{d\psi}{dy} + \left(\frac{dx}{dy} \right) \psi$$

$$3) \left\{ y, \frac{d}{dx} \right\} \psi = 2y \frac{d\psi}{dx} + \left(\frac{dy}{dx} \right) \psi$$

$$4) \left\{ y, \frac{d}{dy} \right\} \psi = 2 \frac{d\psi}{dy} + \psi$$