

Given the free particle kernel

$$K_0(b, a) = \left( \frac{m}{2\pi i \hbar (t_b - t_a)} \right)^{1/2} \exp \left( \frac{im(x_b - x_a)^2}{2\hbar(t_b - t_a)} \right)$$

show that

$$\frac{\partial K_0}{\partial t_b} = -\frac{i}{\hbar} \left( -\frac{\hbar^2}{2m} \frac{\partial^2 K_0}{\partial x_b^2} \right)$$

Solution

$$K_0 = \sqrt{m / 2 / \pi / i / \hbar} / (t_b - t_a) * \exp(i m (x_b - x_a)^2 / 2 / \hbar / (t_b - t_a))$$

$$d(K_0, t_b) == -i / \hbar (-\hbar^2 / 2 / m d(K_0, x_b, x_b))$$