

From equation (3.42)

$$\psi(x_b, t_b) = \int_{-\infty}^{\infty} K(x_b, t_b, x_a, t_a) \psi(x_a, t_a) dx_a$$

Hence the integral over x_a in (1) is equivalent to $\psi(x_b)$.

$$\int_{-\infty}^{\infty} \int_{-\infty}^{\infty} \chi^*(x_b) K(x_b, t_b, x_a, t_a) \psi(x_a) dx_a dx_b = \int_{-\infty}^{\infty} \chi^*(x_b) \psi(x_b) dx_b$$

Then by equation (5.32)

$$P(X) = \left| \int_{-\infty}^{\infty} \chi^*(x_b) \psi(x_b) dx_b \right|^2$$

where X is upper-case χ .