

PH423 Assignment 1

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Question 1.

We consider the action of $\hat{\mathbf{P}}$ on an arbitrary state ϕ ,

$$\hat{\mathbf{P}}\phi(x) \tag{1}$$

to derive a weak equivalence with the desired result.

Starting with eq. (1), we first write it in bra-ket notation as

$$\hat{\mathbf{P}}\phi(x) = \langle x | \hat{\mathbf{P}} | \phi \rangle . \tag{2}$$

On the right hand side, we write $\hat{\mathbf{P}} = \hat{\mathbf{P}} \cdot \hat{\mathbf{1}}$ and use the completeness relation for the position space, $\int d^3x' |x'\rangle\langle x'| = \hat{\mathbf{1}}$, to obtain

$$\hat{\mathbf{P}}\phi(x) = \int d^3x' \langle x | \hat{\mathbf{P}} | x' \rangle \langle x' | \phi \rangle \tag{3}$$

Question 2.

Sad World

Question 3.

Goodbye World