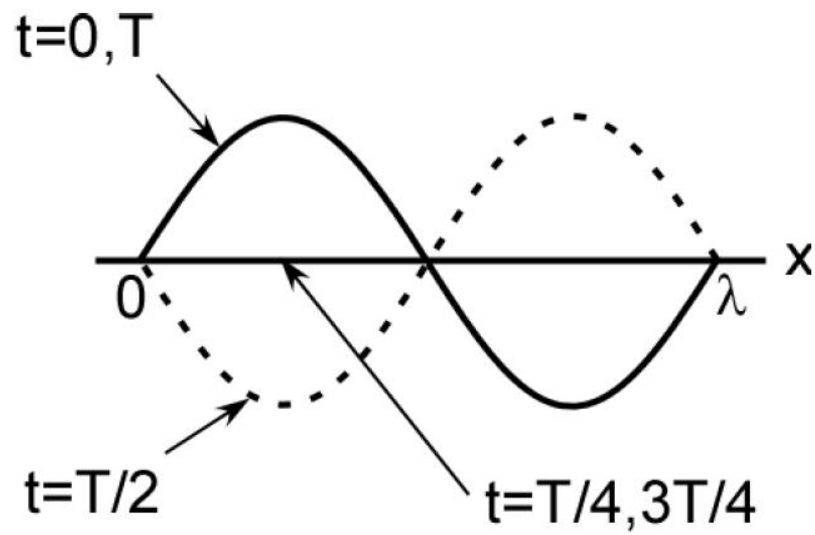


## Quantum Mechanics Solutions 2:

### STANDING WAVES REAL

[easy] 1. See sketch below

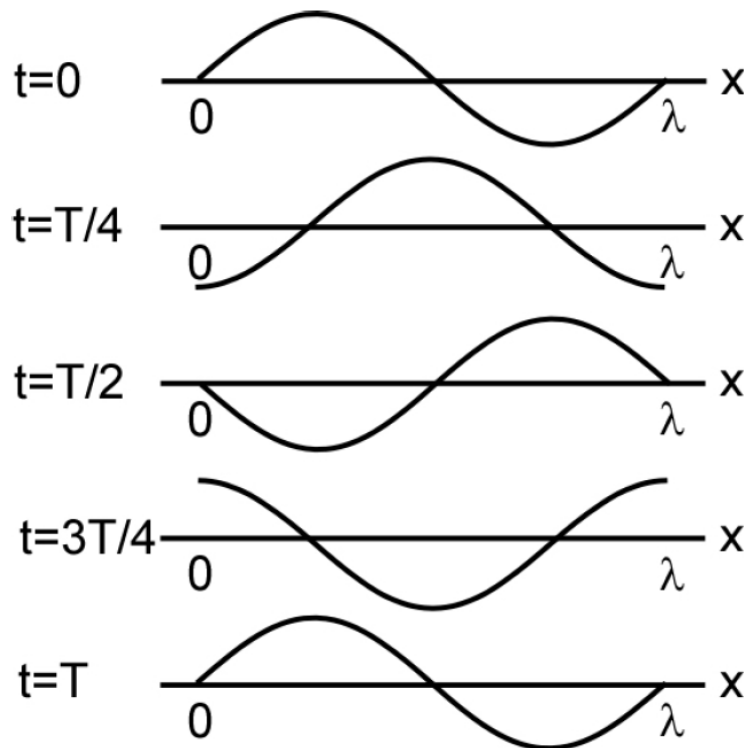


[medium] 2. The right- and left-moving traveling waves are:

$$\psi_R(x, t) = -\sin\left(\frac{2\pi t}{T} - \frac{2\pi x}{\lambda}\right)$$

$$\psi_L(x, t) = \sin\left(\frac{2\pi t}{T} + \frac{2\pi x}{\lambda}\right)$$

Note the difference in the sign in front of the  $\frac{2\pi x}{\lambda}$  term. See sketch:



$$\text{velocity} = \frac{\text{distance}}{\text{time}} = \frac{\lambda}{T}$$

[hard] 3. In terms of **E** and **p**, the right- and left-moving traveling waves are:

$$\psi_R(x, t) = -\sin\left(\frac{1}{\hbar}(Et - px)\right)$$

$$\psi_L(x, t) = \sin\left(\frac{1}{\hbar}(Et + px)\right)$$

Note the difference in the sign of the momentum.