

**Q:** Show that a wave function in complex form if

- a) Multiply  $i$  by  $\frac{\pi}{2}$  and if
- b) When multiplied by 1, the phase transitions to  $\pi$ .

**Sol:**

a)

$$\begin{aligned}\psi &= Ae^{i(kx \pm vt)} * i = Ae^{i(kx \pm vt)} * (0 + 1 * i) = Ae^{i(kx \pm vt)} * \sqrt{0^2 + 1^2} * e^{i \tan^{-1}\left(\frac{1}{0}\right)} \\ &= Ae^{i(kx \pm vt)} * e^{\frac{i\pi}{2}} = e^{i\left(kx \pm vt + \frac{\pi}{2}\right)}\end{aligned}$$

b)

$$\begin{aligned}\psi &= Ae^{i(kx \pm vt)} * -1 = Ae^{i(kx \pm vt)} * (-1 + 0 * i) = Ae^{i(kx \pm vt)} * \sqrt{(-1)^2 + 0^2} * e^{i \tan^{-1}\left(\frac{0}{-1}\right)} \\ &= Ae^{i(kx \pm vt)} * e^{i(-\pi)} = e^{i(kx \pm vt - \pi)}\end{aligned}$$