$$\frac{\partial^2\left(y_1+y_2\right)}{\partial t^2}=-A\omega^2\sin\left(kx-\omega t\right)-A\omega^2\sin\left(kx-\omega t+\phi\right)$$

$$\frac{\partial^2\left(y_1+y_2\right)}{\partial x^2}=-Ak^2\sin\left(kx-\omega t\right)-Ak^2\sin\left(kx-\omega t+\phi\right)$$

$$\frac{\partial^2 y\left(x,t\right)}{\partial x^2}=\frac{1}{v^2}\frac{\partial^2 y\left(x,t\right)}{\partial t^2}$$

$$-A\omega^2\sin\left(kx-\omega t\right)-A\omega^2\sin\left(kx-\omega t+\phi\right)=\left(\frac{1}{v^2}\right)\left(-Ak^2\sin\left(kx-\omega t\right)-Ak^2\sin\left(kx-\omega t+\phi\right)\right)$$

$$v=\frac{\omega}{k}$$