$$y(x,t) = A\cos(kx - \omega t)$$

$$\frac{\partial^2 y}{\partial x^2} = \quad -k^2 \quad A\cos(kx - \omega t)$$

$$\frac{\partial^2 y}{\partial t^2} = \quad -\omega^2 \quad A\cos(kx - \omega t)$$

$$k^2 \quad A\cos(kx - \omega t) = \quad (\frac{k^2}{\omega^2}) \quad \omega^2 \quad A\cos(kx - \omega t)$$

$$\frac{k}{\omega} = \frac{2\pi/\lambda}{2\pi f} = \frac{1}{f\lambda}$$

$$\frac{\partial^2 y}{\partial x^2} \quad = \quad \frac{1}{V^2} \quad \frac{\partial^2 y}{\partial t^2}$$

$$\frac{\partial^2 E}{\partial x^2} \quad = \quad \frac{1}{c^2} \quad \frac{\partial^2 E}{\partial t^2}$$

$$\nabla^2 E \quad = \quad \frac{1}{c^2} \quad \frac{\partial^2 E}{\partial t^2}$$

$$\begin{aligned} y_1(x,t) &= A_1\cos(k_1 x - \omega_1 t + \phi_1) \\ y_2(x,t) &= A_2\cos(k_2 x - \omega_2 t + \phi_2) \end{aligned}$$

$$\begin{aligned} y_1(x,t) &= A\sin(k_1 x - \omega_1 t) \\ y_2(x,t) &= A\sin(k_2 x - \omega_2 t) \end{aligned}$$

$$\sin(\alpha) + \sin(\beta) \quad = \quad 2\cos(\frac{\alpha - \beta}{2})\ \sin(\frac{\alpha + \beta}{2})$$

$$y1 + y2 \quad = \quad 2A\cos(\frac{\Delta k}{2}x - \frac{\Delta\omega}{2}t)\ \sin(k_{\mathrm{avg}}x - \omega_{\mathrm{avg}}t)$$

$$\begin{aligned} y_1(x,t) &= A\sin(kx - \omega t) \\ y_2(x,t) &= A\sin(kx + \omega t) \end{aligned}$$

$$
\begin{aligned}
y_1(x,t) &= A\sin(k_1 x - \omega_1 t) \\
y_2(x,t) &= A\sin(k_2 x - \omega_2 t)
\end{aligned}
$$

$$
\begin{aligned}
\Delta k &\equiv k_1 - k_2 \\
\Delta \omega &\equiv \omega_1 - \omega_2
\end{aligned}
$$

$$
\begin{aligned}
k_{avg} &\equiv \frac{(k_1 + k_2)}{2} \\
\omega_{avg} &\equiv \frac{\omega_1 + \omega_2}{2}
\end{aligned}
$$