

Assignment 1

1. Consider a one-dimensional wave $\phi(x, t)$ which moves with speed c without changing shape. Show that the wave equation is

$$\left(\frac{\partial^2}{\partial x^2} - \frac{1}{c^2} \frac{\partial^2}{\partial t^2} \right) \phi(x, t) = 0$$

[15]

2. Consider the disturbance

$$\phi = \phi(lx + my + nz - ct)$$

where l, m, n are direction cosines, c is a wave speed, and

$$l^2 + m^2 + n^2 = 1$$

Show that ϕ represents a three dimensional plane wave.

[15]