Superposition

A key point for this course!

Use the fact that $\frac{d(y+z)}{dx} = \frac{dy}{dx} + \frac{dz}{dx}$

The derivative is a "linear operator".

Consider two wave equation solutions, h_1 and h_2:

$$\frac{\partial^2 h_1}{\partial x^2} = \frac{1}{v^2}\frac{\partial^2 h_1}{\partial t^2} \text{ and } \frac{\partial^2 h_2}{\partial x^2} = \frac{1}{v^2}\frac{\partial^2 h_2}{\partial t^2}$$

Add them: $\frac{\partial^2 (h_1 + h_2)}{\partial x^2} = \frac{1}{v^2}\frac{\partial^2 (h_1 + h_2)}{\partial t^2}$

$h_1 + h_2$ is also a solution !!

In general, if h_1 and h_2 are solutions then so is $ah_1 + bh_2$.

This is superposition. It is a very useful analysis tool.