
Math - 2

You've probably had ordinary differential equations in your undergraduate classes. There's a different class of differential equations called Partial Differential Equations which are equations of two variables like equation (1) below:

$$\frac{\partial^2 y}{\partial x^2} = \frac{1}{c^2} \frac{\partial^2 y}{\partial t^2} \quad (1)$$

These can be tricky to solve, but sometimes we get a lucky break. If the partial equation is of the right form, we can try to separate the equation, e.g.:

Part 1 (40 pts):

Using a trial solution $y(x,t)=Y(x)G(t)$ separate the partial differential equation (1) into functions of either x or t .

Part 2 (30 pts):

What are the general solutions to these two ordinary differential equations?

and so what is the total solution in terms of x and t ?

Part 3 (30 pts):

Assuming no external loads and given that $y(0,t)=0$ and $y(L,t)=0$, find an expression for the natural frequencies of the system.