Homework #5

Problem 2 - 4.1.9:

$$\Box^2 = \nabla^2 - \frac{1}{c^2}\frac{\partial^2}{\partial t^2} = \sum_{i=1}^{4}\frac{\partial^2}{\partial x_i^2}. \tag{1}$$

But we see that Eq.(1) can be written as a contraction of the derivative operator which, using Einstein's notation, becomes:

$$\sum_{i=1}^{4}\frac{\partial^2}{\partial x_i^2} = \partial_i\partial^i. \tag{2}$$

Since we are contracting two tensors of rank 1 the resultant is a tensor of rank 0, i.e., a scalar.