

In the name of God

Department of Physics
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MODERN PHYSICS

Exercise Set 3

(Due Date: 1403/01/31)

1. Show that in 1-dimension, for any given Force, we can always $F = \partial_x V$, where V is Potential energy.
2. Show that the wave equation of light is not invariant under the Galilean transformation:

$$\frac{\partial^2 \Phi}{\partial x^2} + \frac{\partial^2 \Phi}{\partial y^2} + \frac{\partial^2 \Phi}{\partial z^2} - \frac{1}{c^2} \frac{\partial^2 \Phi}{\partial t^2} = 0$$

Hint: $\frac{\partial \Phi}{\partial x'} = \frac{\partial \Phi}{\partial x} \frac{\partial x}{\partial x'} + \frac{\partial \Phi}{\partial y} \frac{\partial y}{\partial x'} + \frac{\partial \Phi}{\partial z} \frac{\partial z}{\partial x'} + \frac{\partial \Phi}{\partial t} \frac{\partial t}{\partial x'}$

3. In the Michelson-Morley experiment, show that if we consider the velocity of light does not change, therefore the result is consistent with observation.
4. All questions of chapter 2 for Krane, Kenneth S. Modern physics. John Wiley & Sons, 2019 must be answered.
5. Problems no. 2, 3, 5, 7, 15, 16, 19, 23, 32, 36, 50, 54, 58, 64 of chapter 2 for Krane, Kenneth S. Modern physics. John Wiley & Sons, 2019.

Good luck, Movahed
