Assignment #8

Foundation of Physics: Phys 1001

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Do problems #42 #64 and #75 (Chapter 7). For #75 neglect the size of the ball of mass m. Then do problems #16 and #35 of the book (Chapter 13). For #16 the surface is frictionless and read the text below on the second-order linear ordinary differential equation for simple harmonic motion.

Please provide the detail of the solution not just the answer for ALL problems!

Consider Hooke's law for a perfect spring:

$$F = -k\,x\,.$$

Here, it is a 1D motion so we can drop the vector notation. A second-order linear ordinary differential equation is obtained from Newton's second law $F = m\,a$. Indeed:

$$\frac{d^2x}{dt^2} = -(\frac{k}{m})\,x.$$

The general solution of this equation is:

$$x(t) = A\cos(w\,t - \phi),$$

where $A = x_{\max}$, $w = \sqrt{k/m}$ and ϕ a constant phase to meet the initial conditions. Read your text book and analyse the force on the mass to solve problem #35 of Chapter 13. Justify.