PAL Problem set for PHYS 5A

Oscillations

Always explain your answers and show your work.

Problem 1 - A 3-kg mass is connected to a spring and at rest. You then push it back by 0.5 m and release it. Its maximum acceleration is 10 m/s². At the point of maximum acceleration, what is the (a) spring constant and the (b) restoring force?

Problem 2 - A mass-spring system with an angular frequency $\omega = 8\pi$ rad/s oscillates back and forth. (a) Assuming it starts from rest, how much time elapses after it starts to oscillate before the mass is at rest again? (b) How many full cycles does the system complete in 60 s?

Problem 3 - A 4-kg mass is attached to a horizontal spring and oscillates at 2 Hz. If the mass is moving with 10 m/s when it crosses its equilibrium position, (a) how long does it take to get from equilibrium to the point where the spring has its maximum extension? Find the (b) amplitude and (c) maximum acceleration.

Problem 4 - A 5 kg mass oscillates on a horizontal spring with k = 30 N/m and an amplitude of 0.4 m. Find its (**a**) max speed, (**b**) speed when it is at −0.2 m, and (**c**) the total mechanical energy of the system.