1. Show that if $x1(t)$ is a solution of the forced damped oscillator for a driving force $F1(t)$, and if $x_2(t)$ is a solution for a different driving force $F_2(t)$, then the force $F(t) = F_1(t) + F_2(t)$ gives the solution $x(t) = x_1(t) + x_2(t)$, provided that the initial conditions $x(0)$ and $\dot{x}(0)$ for the superposition are also the corresponding sums of the initial conditions, i.e., provided $x(0) = x_1(0) + x_2(0)$ and $\dot{x}(0) = \dot{x}_1(0) + \dot{x}_2(0)$.

2. Verify that $x = Ae^{-\alpha t}\cos\omega t$ is a possible solution of the equation $\ddot{x}(t) + \gamma\dot{x}(t) + \omega_\circ^2 x = 0$ and find α and ω in terms of γ and $\omega_\circ$.

3. A cylinder of density ρ is floating vertically in a liquid of density 2ρ. The cylinder has a length l and radius r. If it is tapped slightly then find the frequency of oscillation.

4. A U-tube has vertical arms of radii r and $2r$, connected by a horizontal tube of length l whose radius increases linearly from r to $2r$. The U-tube contains liquid up to a height h in each arm. The liquid is set oscillating, and at a given instant the liquid in the narrower arm is a distance y above the equilibrium level. Find the period of oscillation if $l = 5h/2$. Note: if liquid is not to pile up anywhere, the product velocity $\times$ cross-section must have the same value everywhere along the tube.