1. Find the general solution of the equation/solve the initial value problem
   (a) \( y'' + 6y' + 9y = t \cos(2t) \)

   (b) \( 4y'' + y' = 4t^3 + 48t^2 + 1 \)
2. Find the form of a particular solution for each of the following nonhomogeneous equations.

(a) \( y'' + 2y' + 2y = e^{-t} \sin t + e^{-t} \cos 2t \)

(b) \( y'' - 2y' + y = te^t + t^2 e^{-t} + e^t \cos t + t^2 \)
3. Find the general solution of the equation $y'' + 6y' + 9y = \frac{e^{-3x}}{1 + 2x}$. 
4. A mass weighing 3 lb stretches a spring 3 in. If the mass is pushed upward, contracting the spring a distance of 1 in, then set in motion with a downward velocity of 2 ft/s, and if there is no damping, find the position \( u \) of the mass at any time \( t \). Determine the frequency, period, amplitude and phase angle of the motion.
5. A spring is stretched 10 cm by a force of 3 N. A mass of 2 kg is hung from the spring and is also attached to a viscous damper that exerts a force of 3 N when the velocity of the mass 5 m/s. If the mass is pulled down 5 cm below its equilibrium position and given an initial velocity of 10 cm/s, determine its position $u$ at any time. Find the quasifrequency of the motion.
6. A spring is stretched 6 in by a mass that weighs 8 lb. The mass is attached to a dashpot mechanism that has a damping constant of 0.25 lb·s/ft and is acted by an external force of $4\cos2t$ lb.

(a) Find the steady-state response of this system.

(b) If the given mass is replaced by a mass $m$, determine the value of $m$ for which the amplitude of the steady-state response is maximum.

(c) If the mass is the same as in the problem, determine the value $\omega$ of the frequency of the external force $4\cos\omega t$ lb at which “practical resonance” occurs, i.e., the amplitude of the steady-state response is maximized.