1. Find the solution to the given initial value problem.

   (a) $y'' + 4y = t^2 + 3e^t, \qquad y(0) = 0, \quad y'(0) = 2.$

(b) $y'' + 4y = 3\sin 2t, \qquad y(0) = 2, \quad y'(0) = -1.$

(c) $y'' + 2y' + 5y = 4e^{-t}\cos 2t \qquad y(0) = 1, y'(0) = 0.$

2. Determine a suitable form for $y(t)$ if the method of undetermined coefficients is to be used

   (a) $y'' + 3y' = 2t^4 + t^2e^{-3t} + \sin 3t.$

   (b) $y'' + 4y = t^2 \sin 2t + (6t + 7) \cos 2t.$

   (c) $y'' + 2y' + 2y = 3e^{-t} + 2e^{-t} \cos t + 4t^2e^{-t} \sin t.$

3. Use the method of variation of parameters to find a particular solution to

   (a) $y'' + y = \tan x$.

(b) $y'' + 4y' + 4y = t^{-2}e^{-2t}$.

(c) $y'' - 2y' + y = \frac{e^t}{(1+t^2)}$.

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 and amplitude of the motion.

5. A series circuit has a capacitor of 10^{-5} F, a resistor of 3×10^2 Ω, and an inductor of 0.2 H. The initial charge of the capacitor is 10^{-6} C and there is no initial current. Find the charge Q on the capacitor at any time t.

6. A mass of 4 lb stretches a spring 1.5 in. The mass is displaced 2 in. in the positive direction from its equilibrium position and released with no initial velocity. Assuming that there is no damping and that the mass is acted on by an external force of $2\cos 3t$ lb, formulate the initial value problem describing the motion of the mass.