# Review

1. Solve the differential equations

$$\begin{aligned} &y'' + 5y' + 4y = 0, \\ &y'' + 12y' + 36y = 0, \\ &y'' + 4y' + 5y = 0. \end{aligned}$$

2. Solve the initial value problems

$$\begin{aligned} &y'' - 6y' + 8y = 0, \quad y(0) = 2, y'(0) = 5, \\ &y'' - 6y' + 9y = 0, \quad y(0) = 4, y'(0) = -1. \end{aligned}$$

3. Solve the differential equations

$$\begin{aligned} &y'' - 2y' + y = t + e^t, \\ &y'' - 7y' + 12y = \sin 2t, \\ &y'' + 2y' + 2y = \cos t, \\ &y'' + 9y = 9\sec^2(3t), \\ &y'' - 4y' + 4y = (t+1)e^{2t}. \end{aligned}$$

4. A object having the mass of 2kg oscillates at the end of a spring. The extreme displacement is 0.1 m and the period of oscillation is 2s. Find the spring constant. Find the location of the object half a second after it has passed through the center of the oscillation.

5. A mass of 20 g stretches a spring 5 com. Suppose that the mass is also attached to a viscous damper that exerts a force of 5N when the velocity of the mass is 2m/s. If the mass is pulled down 2cm and then released, find the position u at time t.

6. A object with mass half a kilogram is attached to a spring that has almost no friction and the constant of the spring is 8N/m. An external force of $3\cos 4t$ N acts upon the object. What is the equation of the motion?