

1.Find the general solution:

$$y'' - 3y' + 2y = e^t \sin t.$$

2.Find a general solution to the equation below.

$$(x + 1)^2 y'' + 10(x + 1)y' + 14y = 0, \quad x > -1.$$

3.A mass of .5 kg stretches a spring vertically by 10cm in its equilibrium position. The mass is acted upon by an external force of $10 \sin t$ N and moves vertically in a medium that imparts a viscous force of 2N when the speed of the mass is 4cm/s.

(a)If the mass is set in motion from its equilibrium position with an initial velocity of 8cm/s, formulate the initial value problem describing its motion. (Use $g = 10m/s^2$ if necessary).

(b)Find the steady-state solution of the equation in (a).

(c)Assume now that no viscous force acts on the mass. What is the resonance frequency of the system?

4.Use the method of reduction of order to find the general solution of:

$$(x - 1)y'' - xy' + y = 0, \quad x > 1,$$

given that $y_1(x) = e^x$ is a solution.