

In each of Problems 1 through 8, find the general solution of the given differential equation.

1.  $y'' + 2y' - 3y = 0$
2.  $y'' + 3y' + 2y = 0$
3.  $6y'' - y' - y = 0$
4.  $2y'' - 3y' + y = 0$
5.  $y'' + 5y' = 0$
6.  $4y'' - 9y = 0$
7.  $y'' - 9y' + 9y = 0$
8.  $y'' - 2y' - 2y = 0$

In each of Problems 9 through 16, find the solution of the given initial value problem. Sketch the graph of the solution and describe its behavior as  $t$  increases.

9.  $y'' + y' - 2y = 0$ ,  $y(0) = 1$ ,  $y'(0) = 1$
10.  $y'' + 4y' + 3y = 0$ ,  $y(0) = 2$ ,  $y'(0) = -1$
11.  $6y'' - 5y' + y = 0$ ,  $y(0) = 4$ ,  $y'(0) = 0$
12.  $y'' + 3y' = 0$ ,  $y(0) = -2$ ,  $y'(0) = 3$
13.  $y'' + 5y' + 3y = 0$ ,  $y(0) = 1$ ,  $y'(0) = 0$
14.  $2y'' + y' - 4y = 0$ ,  $y(0) = 0$ ,  $y'(0) = 1$
15.  $y'' + 8y' - 9y = 0$ ,  $y(1) = 1$ ,  $y'(1) = 0$
16.  $4y'' - y = 0$ ,  $y(-2) = 1$ ,  $y'(-2) = -1$
17. Find a differential equation whose general solution is  $y = c_1e^{2t} + c_2e^{-3t}$ .

In each of Problems 7 through 16, find the general solution of the given differential equation.

7.  $y'' - 2y' + 2y = 0$
8.  $y'' - 2y' + 6y = 0$
9.  $y'' + 2y' - 8y = 0$
10.  $y'' + 2y' + 2y = 0$
11.  $y'' + 6y' + 13y = 0$
12.  $4y'' + 9y = 0$
13.  $y'' + 2y' + 1.25y = 0$
14.  $9y'' + 9y' - 4y = 0$
15.  $y'' + y' + 1.25y = 0$
16.  $y'' + 4y' + 6.25y = 0$

In each of Problems 17 through 22, find the solution of the given initial value problem. Sketch the graph of the solution and describe its behavior for increasing  $t$ .

17.  $y'' + 4y = 0$ ,  $y(0) = 0$ ,  $y'(0) = 1$
18.  $y'' + 4y' + 5y = 0$ ,  $y(0) = 1$ ,  $y'(0) = 0$
19.  $y'' - 2y' + 5y = 0$ ,  $y(\pi/2) = 0$ ,  $y'(\pi/2) = 2$
20.  $y'' + y = 0$ ,  $y(\pi/3) = 2$ ,  $y'(\pi/3) = -4$
21.  $y'' + y' + 1.25y = 0$ ,  $y(0) = 3$ ,  $y'(0) = 1$
22.  $y'' + 2y' + 2y = 0$ ,  $y(\pi/4) = 2$ ,  $y'(\pi/4) = -2$

In each of Problems 1 through 10, find the general solution of the given differential equation.

1.  $y'' - 2y' + y = 0$
2.  $9y'' + 6y' + y = 0$
3.  $4y'' - 4y' - 3y = 0$
4.  $4y'' + 12y' + 9y = 0$
5.  $y'' - 2y' + 10y = 0$
6.  $y'' - 6y' + 9y = 0$

7.  $4y'' + 17y' + 4y = 0$

8.  $16y'' + 24y' + 9y = 0$

9.  $25y'' - 20y' + 4y = 0$

10.  $2y'' + 2y' + y = 0$

In each of Problems 11 through 14, solve the given initial value problem. Sketch the graph of the solution and describe its behavior for increasing  $t$ .

11.  $9y'' - 12y' + 4y = 0, \quad y(0) = 2, \quad y'(0) = -1$

12.  $y'' - 6y' + 9y = 0, \quad y(0) = 0, \quad y'(0) = 2$

13.  $9y'' + 6y' + 82y = 0, \quad y(0) = -1, \quad y'(0) = 2$

14.  $y'' + 4y' + 4y = 0, \quad y(-1) = 2, \quad y'(-1) = 1$