

**Exercise 01:** Solve the following differential equations and determine their type:

- 1)  $(x^2 + 1)y' = y^2 + 1$ ,      2)  $(3y + x)dx - (3x + y)dy = 0$ ,  
3)  $xy' + y(x + 1) = e^x$ ,      4)  $y' + y \tan x = \sin 2x$ , with  $y(0) = 1$ ,  
5)  $xyy' = y^2 - x(x - y)$ ,      6)  $(y + x - 3)dx + (x - y - 1)dy = 0$ ,  
7)  $(2x - 3)y' = x + 2y + 1$ ,      8)  $y' = e^x y^2 - 2y$ ,  
9)  $y' = xy(x^2 y^2 - 1)$ ,      10)  $y' \sin x = y \ln x$ , avec  $y\left(\frac{\pi}{2}\right) = e$ ,

11)  $y' + y^2 - 2y \sin x + \sin x^2 - \cos x = 0$ , where  $y = \sin x$  is a particular solution.

**Exercise 02:** Solve the following differential equations and determine their type:

- 1)  $y'' + 2y' + y = 0$ ,      2)  $y'' - y' + 2y = 0$ , with  $y(0) = 1$  and  $y'(0) = -1$ ,  
3)  $y'' + 3y' + 2y = 0$ ,      4)  $y'' + 4y' + 3y = 3(x^2 + 1)$ , with  $y(0) = 1$  and  $y'(0) = -1$ ,  
5)  $y'' - 2y' + 5y = 2 \sin x \cos x$ ,      6)  $y'' + 4y' + 3y = (x^2 + 1)e^x$ ,  
7)  $y'' - 4y' + 3y = 3x + 2 + 4e^x + 5e^{-x}$ ,      8)  $y'' - 2y' = e^x \sin x$ .