Topics: the notion of a differential equation; separable differential equations.

1. Verify that the function \( y = Cx^3 \), where \( C \) is some constant, is a solution of the differential equation \( 3y - xy' = 0 \).

2. Determine if the function \( y = 3 - e^{-x^2} \) is a solution of the equation \( xy' + 2y = e^{-x^2} \).

3. For which values of \( a \) the function \( y = \cos ax \) becomes a solution of the equation \( y'' + 10y = 0 \)?

4. Solve a separable differential equation.
   a) \( y' = 3y \)
b) \( xy' - y = 0 \)

c) \( \frac{dy}{dx} = \frac{1+y}{1-x} \)

d) \( z' = 10^{x+z} \)

e) \( xy' + y = y^2 \)

Hint: Recall the product rule \((uv)' = u'v + uv'\).