

### Problem Definition

Problem 15. Verify that the function is a solution of the differential equation.

$$y = Ce^{-t/3} + 7 \quad 3\frac{dy}{dt} + y - 7 = 0$$

### Solution Step 1:

The idea is to substitute the given function  $y(t)$  and the derivative of  $y(t)$  into the equation to see if the equation is true for this choice. So, for

$$y = Ce^{-t/3} + 7$$

we compute the derivative with respect to  $t$ . This is

$$y' = Ce^{-t/3} \frac{-1}{3} + 0 = -\frac{C}{3}e^{-t/3}$$

### Solution Step 2:

The next step is to substitute the function and derivative into the differential equation

$$3\frac{dy}{dt} + y - 7 = 0$$

The substitution into the terms on the left hand side gives

$$3\left(-\frac{C}{3}e^{-t/3}\right) + Ce^{-t/3} + 7 - 7 = -Ce^{-t/3} + Ce^{-t/3} = 0$$

The steps above show that the function given in the problem makes the left hand side of the equation zero which matches the right hand side. Therefore the is a solution of the differential equation.