Answer on Question #82234 – Math – Differential Equations

Question

Solve the initial value problem
$y'' - 2y' + y = 0$; $y(1) = y'(1) = 0$

A. y(0) = 3
B. y(0) = 1
C. y(0) = 2
D. y(0) = 0

Solution

Let us construct the characteristic equation:

$$k^2 - 2k + 1 = 0$$
$$(k-1)^2 = 0$$

This equation has two equal roots k = 1;
The solution can be written in the form:

$$y(x) = e^{kx}(C_1 + C_2 x)$$

$$y(x) = e^{x}(C_1 + C_2 x)$$

Then we substitute the initial conditions:

$$y(1) = e(C_1 + C_2) = 0$$
$$y'(1) = (C_1 e^x + C_2 x e^x + C_2 e^x)|_{x=1} = e(C_1 + 2C_2) = 0$$

We obtain the system:

$$\begin{cases} C_1 + C_2 = 0 \\ C_1 + 2C_2 = 0 \end{cases}$$

Therefore, $C_1 = 0$, $C_2 = 0$.
Only the zero solution satisfies the initial conditions: $y \equiv 0$
Thus, y(0)=0, and the right answer is D).
Answer: D) y(0) = 0.