Answer on Question #72300 – Math – Calculus

Question

$$\frac{dy}{dx} - 4y(x) = 0, \quad y(0) = 1$$

Solution

Given equation

$$\frac{dy}{dx} - 4y(x) = 0, \quad \dots \dots \dots (i)$$

here y(0) = 1.

We know that
$$L\left(\frac{dy}{dx}\right) = s^1 \overline{y}(s) - s^0 y(0)$$
 (*ii*)

Putting the value of (ii) into (i), we get

$$\begin{bmatrix} s^{1}\bar{y}(s) - s^{0}y(0) \\ s^{1}\bar{y}(s) - 4\bar{y}(s) \end{bmatrix} - 4\bar{y}(s) = 0$$
(*iii*)
$$\begin{bmatrix} s^{1}\bar{y}(s) - 4\bar{y}(s) \\ s^{0} \end{bmatrix} - y(0) = 0$$
(*iv*)

Using y(0)=1, equation (iv) will become

$$(s-4)\overline{y} = 1$$

$$\overline{y} = \frac{1}{s-4}$$
 (v)

Taking Laplace inverse L^{-1} on both sides of (v), we get

 $y(t)=e^{4t}$

because $L(e^{at}) = \frac{1}{s-a}$, $L^{-1}(\frac{1}{s-a}) = e^{at}$.

Hence the solution of the problem will be $y(t)=e^{4t}$.

Answer: $y(t)=e^{4t}$.

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