Answer on Question #72300 – Math – Calculus

Question

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

Solution

Given equation

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

here $y(0) = 1$.

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

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

$$\left[s^1 \bar{y}(s) - s^0 y(0)\right] - 4\bar{y}(s) = 0 \quad (iii)$$

$$\left[s^1 \bar{y}(s) - 4\bar{y}(s)\right] - y(0) = 0 \quad (iv)$$

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

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

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

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