

QUESTION

Find a particular integral of the differential equation  $\frac{d^2x}{dt^2} + 4x = e^{-t}$ .

ANSWER

$$\frac{d^2x}{dt^2} + 4x = e^{-t}$$

To find a particular integral try  $x = Ce^{-t}$ ,  $\frac{dx}{dt} = -Ce^{-t}$ ,  $\frac{d^2x}{dt^2} = Ce^{-t}$

Substituting this into the ODE gives:

$$Ce^{-t} + 4(Ce^{-t}) = 5Ce^{-t} = e^{-t} \text{ therefore } C = \frac{1}{5}$$

Hence a particular integral is  $x = \frac{1}{5}e^{-t}$ .