Differential Equations - Class XII

Past Year JEE Questions

Questions

Quetion: 01

If y = y(x) is the solution of the differential equation

$\frac{dy}{dx}$ + (tan x) y = sin x, $0 \le x \le \frac{\pi}{3}$, with y(0) = 0, then $y\left(\frac{\pi}{4}\right)$ equal to :

A. $\frac{1}{2}\log_e 2$

B. $\left(\frac{1}{2\sqrt{2}}\right) \log_e 2$

C. $\log_e 2$

D. $\frac{1}{4} \log_e 2$

Solutions

Solution: 01

Explanation

Integrating Factor = $e^{\int \tan x\, dx} = e^{\ln(\sec x)} = \sec x$

$y \sec x = \int (\sin x) \sec x\, dx = \ln(\sec x) + C$

$y(0) = 0 \Rightarrow C = 0$

$\therefore y = \cos x \ln|\sec x|$

$y\left(\frac{\pi}{4}\right) = \frac{1}{\sqrt{2}} \ln\left(\sqrt{2}\right) = \frac{1}{2\sqrt{2}} \ln 2$