

Discussion 2

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September 30, 2022

1)

$$\begin{aligned}5 \frac{dy}{dx} + 25xy &= 1 \implies \frac{dy}{dx} + 5xy = \frac{1}{5} \\ P(x) &= 5x \quad f(x) = \frac{1}{5} \\ \mu(x) &= e^{\int 5x dx} = e^{\frac{5x^2}{2}}\end{aligned}$$

2)

$$\begin{aligned}x^2 \frac{dy}{dx} + 2xy &= x \implies \frac{dy}{dx} + \frac{2y}{x} = \frac{1}{x} \\ P(x) &= \frac{2}{x} \quad f(x) = \frac{1}{x} \\ \mu(x) &= e^{\int \frac{2}{x} dx} = e^{2 \ln |x|} = x^2\end{aligned}$$

3)

$$\begin{aligned}\sin(x) \frac{dy}{dx} + \sin(2x)y &= 1 \implies \frac{dy}{dx} + \frac{\sin(2x)}{\sin(x)}y = \csc x = \frac{dy}{dx} + \frac{2 \sin(x) \cos(x)}{\sin(x)}y \\ \frac{dy}{dx} + 2 \cos(x)y &= \csc(x) \implies P(x) = 2 \cos(x) \quad f(x) = \csc(x) \\ \mu(x) &= e^{\int 2 \cos(x) dx} = e^{2 \sin(x)}\end{aligned}$$