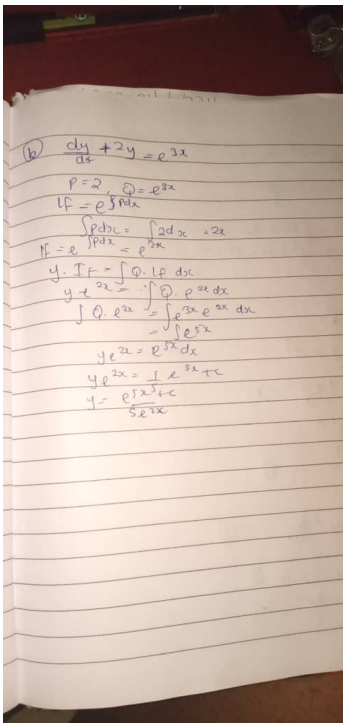


(b) $\frac{dy}{dx} + 2y = e^{3x}$

$P = 2, \quad Q = e^{3x}$

$IF = e^{\int P dx}$

$\int P dx = \int 2 dx = 2x$

$IF = e^{\int P dx} = e^{2x}$

$y \cdot IF = \int Q \cdot IF \, dx$

$y e^{2x} = \int Q \cdot e^{2x} dx$

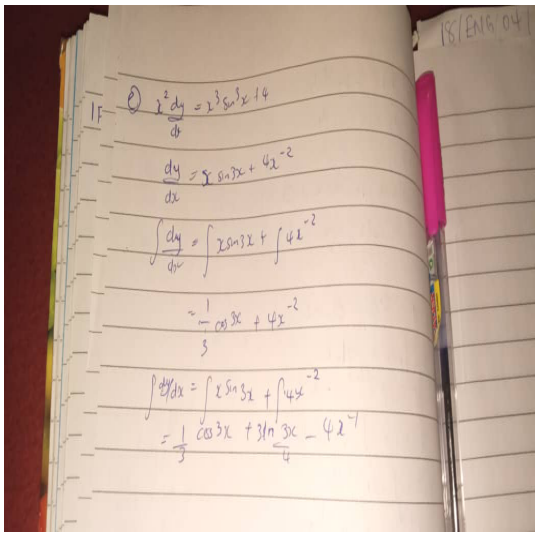
$\int Q \cdot e^{2x} = \int e^{3x} e^{2x} dx$

$= \int e^{5x}$

$y e^{2x} = e^{5x} dx$

$y e^{2x} = \frac{1}{5} e^{5x} + c$

$y = \frac{e^{5x}}{5e^{2x}} + c$



(c) $x^2 \frac{dy}{dx} = x^3 \sin 3x + 4$

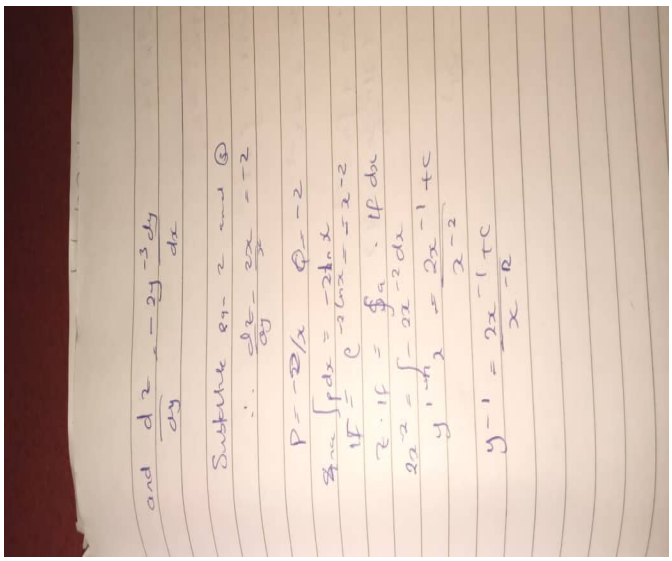
$\frac{dy}{dx} = x \sin 3x + 4x^{-2}$

$\int \frac{dy}{dx} = \int x \sin 3x + \int 4x^{-2}$

$= \frac{1}{3} \cos 3x + 4x^{-2}$

$\int dy/dx = \int x \sin 3x + \int 4x^{-2}$

$= \frac{1}{3} \cos 3x + \frac{1}{9} \sin 3x - 4x^{-1}$



and $\frac{dx}{dy} = -\frac{2y^{-3} dy}{dx}$

Substitute eqn 2 into (1)

$\therefore \frac{dx}{dy} = \frac{2x}{x} = -2$

$P = -2/x \quad Q = -2$

$\int P dx = \int -2 \ln x = -2 \ln x$

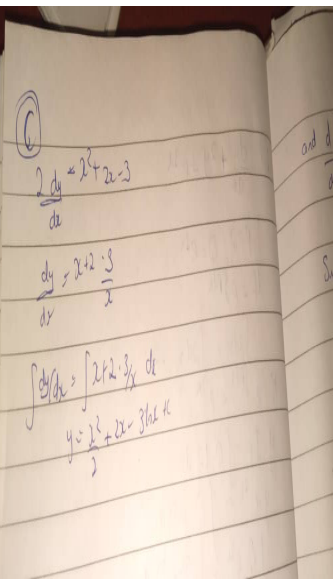
$IF = e^{-2 \ln x} = x^{-2}$

$x^{-2} \cdot IF = \int q \cdot IF \, dx$

$2x^{-2} = \int -2x^{-2} dx$

$y \cdot x^{-2} = \frac{2x^{-1}}{-2} + c$

$y^{-1} = \frac{2x^{-1} + c}{x^{-2}}$



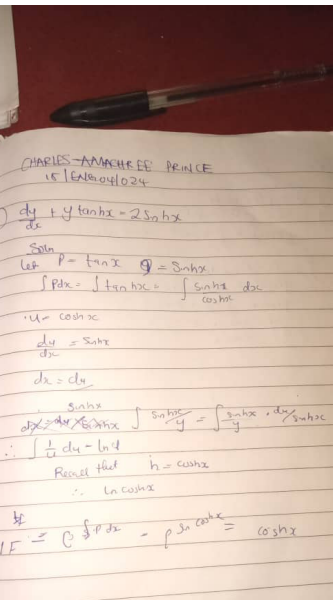
(c)

$2 \frac{dy}{dx} = x^2 + 2x - 3$

$\frac{dy}{dx} = \frac{x^2 + 2x - 3}{2}$

$\int dy/dx = \int \frac{1}{2} x^2 + x - \frac{3}{2} \, dx$

$y = \frac{x^3}{3} + x^2 - \frac{3}{2} x + k$



CHARLES ANACHERE PRINCE
IS/ENG/04/024

$\frac{dy}{dx} + y \tanh x = 2 \sinh x$

Soln

Let $P = \tanh x \quad Q = 2 \sinh x$

$\int P dx = \int \tanh x = \int \frac{\sinh x}{\cosh x} dx$

$u = \cosh x$

$\frac{du}{dx} = \sinh x$

$dx = \frac{du}{\sinh x}$

$\int \frac{\sinh x}{y} = \int \frac{\sinh x}{y} \cdot \frac{du}{\sinh x}$

$\therefore \int \frac{1}{u} du = \ln u$

Recall that $u = \cosh x$

$\therefore \ln \cosh x$

$IF = e^{\int P dx} = e^{\ln \cosh x} = \cosh x$