$$\frac{dy}{dx} = -4\left[\frac{y - Be^{-6x}}{e^{4x}}\right] e^{4x} - 6Be^{-6x}$$

$$= -4y + 4Be^{-6x} - 6Be^{-6x} \quad \text{---(4)}$$

$$= -4y - 2Be^{-6x} \quad \text{---(5)}$$

In equ 5, make B the subj of formula

$$\frac{dy}{dx} = -4y - 2Be^{-6x}$$

$$-2Be^{-6x} = \frac{dy}{dx} + 4y$$

$$2Be^{-6x} = -\frac{dy}{dx} - 4y$$

$$B = \frac{1}{2e^{-6x}}\left[-\frac{dy}{dx} - 4y\right] \quad \text{---(6)}$$

Subst 6 into 3

$$A = y - \left[\frac{1}{2e^{-6x}}\left[-\frac{dy}{dx} - 4y\right]\right] e^{6x}$$

$$e^{-4x}$$

$$A = y - \left[\frac{1}{2}\left[-\frac{dy}{dx} - 4y\right]\right]$$

$$e^{-4x}$$

$$A = y + \frac{dy}{2dx} + 2y \quad \text{---(7)}$$

$$e^{-4x}$$

Put equ. 6 and 7 into 2

$$\frac{d^2y}{dx^2} = 16Ae^{-4x} + 36Be^{-6x}$$

$$= 16\left[\frac{y + \frac{dy}{2dx} + 2y}{e^{4x}}\right] e^{-4x} + 36\left[\frac{1}{2e^{-6x}}\left[-\frac{dy}{dx} - 4y\right]\right] e^{6x}$$

$$\frac{d^2y}{dx^2} = 16y + \frac{16dy}{2dx} + 32y + \frac{36dy}{2dx} - 72y$$

$$\frac{d^2y}{dx^2} = 16y + 8\frac{dy}{dx} + 32y - 18\frac{dy}{dx} - 72y$$

$$\frac{d^2y}{dx^2} = -24y - 10\frac{dy}{dx}$$

$$\frac{d^2y}{dx^2} + 24y + 10dy/dx = 0$$

EZUWA TOCHUKWU DINDE
17/ENG07/010
Petroleum Engineering

ENG 282 Assignment 1

1) a) Define differential equation and give two examples.
b) An expression has been obtained for an engineering system to be as given in Equation (i)

$$y = Ae^{-4x} + Be^{-6x} \quad \text{(i)}$$

i) What is the order of the differential equation that can be formed from the expression?
ii) Give a reason for your answer in b(i)
iii) form a differential equation from the expression

Answer

a) Differential equation is the relationship between a dependent variable and one or more derivative of dependent variable with respect to the independent variable

Examples

- $x\frac{dy}{dx} = 5x^3 + 4$
- $y\tan x \frac{dy}{dx} = (4 + y^2)\sec^2 x$

b) i) Second Order differential equation

ii) This is because it has two constants A and B

iii) $y = Ae^{-4x} + Be^{-6x}$

$$\frac{dy}{dx} = -4Ae^{-4x} - 6Be^{-6x} \quad \text{——— (2)}$$

$$\frac{d^2y}{dx^2} = 16Ae^{-4x} + 36Be^{-6x} \quad \text{——— (3)}$$

$\ln y = Ae^{-4x} + Be^{-6x}$

$$\text{let } A = \frac{y - Be^{-6x}}{e^{-4x}} \quad \text{——— (3)}$$

Sub eqn. 3 in 1

Giving