

NAME: EMMANUEL ELEGIBE

DEPARTMENT: COMPUTER

MATRIC NO: 17/ENG02/020

COURSE: ENG 202

a A differential equation is a relationship between an independent variable x and dependent variable y and one or more derivative of y with respect to x

E.g (i) $dy/dx = 2 + y/x$

(ii) $dy/dx = y + y/x$

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

A second order differential equation

This is because it contains 2 variable

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

solution

$dy/dx = -4Ae^{-4x} - 6Be^{-6x}$ (i)

$d^2y/dx^2 = 16Ae^{-4x} + 36Be^{-6x}$ (ii)

solving equation i and (ii) simultaneously

multiple eqn (i) by 6

$6dy/dx = -24Ae^{-4x} - 36Be^{-6x}$ — iii

$d^2y/dx^2 = 16Ae^{-4x} + 36Be^{-6x}$ — iv

$6dy/dx + d^2y/dx^2 = -84Ae^{-4x}$

$\therefore A = 6 dy/dx + d^2y/dx^2$ — (v)

substituting eqn (v) with eqn (i)

$dy/dx = 4 \left(\frac{6 dy/dx + d^2y/dx^2}{8e^{-4x}} \right) e^{-4x} - 6Be^{-6x}$

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

Multiply through by 2

$2 dy/dx = 6 dy/dx + d^2y/dx^2 - 12Be^{-6x}$

$2 dy/dx - 6 dy/dx = d^2y/dx^2 - 12Be^{-6x}$

$-4 dy/dx - d^2y/dx^2 = -12Be^{-6x}$

$-4 dy/dx - d^2y/dx^2 = B$

$\therefore y = \frac{6 dy/dx + d^2y/dx^2}{2} \times e^{-4x} + \frac{4 dy/dx + d^2y/dx^2}{+12e^{-6x}}$

$$y = +18 \frac{dy}{dx} + 3 \frac{d^2y}{dx^2} - 8 \frac{dy}{dx} - 2 \frac{d^2y}{dx^2}$$

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

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

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

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