



NATIONAL OPEN UNIVERSITY OF NIGERIA  
Plot 91, Cadastral Zone, Nnamdi Azikiwe Expressway, Jabi, Abuja

FACULTY OF SCIENCES  
April/May Examination 2019

Course Code: MTH 421  
Course Title: Ordinary Differential Equation  
Credit Unit: 3  
Time Allowed: 3HOURS  
Total: 70 Marks  
Instruction: ATTEMPT NUMBER ONE (1) AND ANY OTHER FOUR (4) QUESTIONS

1(a) Define (i) first order ordinary differential equation. (ii) The concept of solution of first order ordinary differential equation. (4 Marks)

(b) Is  $y(x) = c_1 \sin 2x + c_2 \cos 2x$ , where  $c_1$  and  $c_2$  are arbitrary constant, a solution of

$$y'' + 4y = 0 \quad (9 \text{ Marks})$$

(c) Solve the initial value problem  $y' = 3y$ ,  $y(0) = 5.7$  (9 Marks)

(2) (a) Solve  $\cos(x+y)dx + (3y^2 + 2y + \cos(x+y))dy$  (6 Marks)

(b) Solve the initial value problem  $y' = ky$ ,  $y(0) = y_0$  (6 Marks)

3 (a) Solve  $y''' - 6y'' + 2y' + 36 = 0$  (6 Marks)

(b) Solve  $y'' - y' - 2y = 4x^2$  (6 Mark)

4 (a) Define a critical point of a system (4 Marks)

(b) Determine the nature of the critical point (0,0) of the system  $\begin{cases} x' = 2x - 7y' \\ y' = 3x - 8y' \end{cases}$  and determine whether or not the point is stable (8 Marks)

(5) (a) Solve the following Bernoulli equation, known as the logistic equation (or Verhulst equation)

$$y' = Ay - By^2 \quad (9 \text{ Marks})$$

(b) Define second order linear ordinary differential equation (3 Marks)

6 (a)  $y' + \left(\frac{4}{x}\right)y = x^4$  (6 Marks)

(b) Solve the initial value problem  $y' + y \tan x = \sin 2x$ ,  $y(0) = 1$  (6 Marks)