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

FACULTY OF SCIENCES
DEPARTMENT OF MATHEMATICS
2023_2 EXAMINATIONS—

Course Code: MTH341
Course Title: Real Analysis
Credit Unit: 3
Time Allowed: 3 Hours
Instruction: Answer Number One (1) and Any Other Four (4) Questions

1. (a) Let $f(x) = \sin\frac{1}{x}$, $x \neq 0$. Discuss the continuity of $f(x)$ at all x_0 except $x_0 = 0$ (3 marks)

   (b) Let f(x) = $\sqrt{x}$, $0 \leq x < \infty$. Discuss the continuity of f on $[0,\infty]$ (4 marks)

   (c) When do we say ;

      (i) a function f is continuous at X_0 ? (3 marks)

      (ii) a function f is continuous from the left at X_o? (3 marks)

      (iii) a function f is continuous from the right at X_0 ? (3 marks)

   (d) When is

      (i) a function f said to be non-decreasing on an interval ? (3 marks)

      (ii) a function f said to be monotonic on I ? (3 marks)

2. Define the following

   a.   (i) Continuity of a function at a point (3 marks)
         (ii). Continuity of a function at a point (3 marks)

   b.   Let $f : R \rightarrow R$ be a function defined as $f(x) = x^2 \cos(\frac{1}{x})$ if $x \neq 0$ and

         $f(0) = 0$. Find the derivative of f at x = 0, if it exists (3 marks)

   c.   Let a function $f : [0,5] \rightarrow R$ be defined as $f(x) = \begin{pmatrix} 2x+1, 0 \leq x \leq 3 \\ x^2 - 2, 3 \leq x \leq 5 \end{pmatrix}$

         is f derivable at $x = 3$. (3 marks)