Assignment 2

Semester: Fall 2022
Course Title: Differential Calculus and Co-ordinate Geometry
Course Code: MAT110

Total Marks: 20

You are asked to submit on Tuesday, **01 November 2022**

1. Show that the function f defined by $f(x) = |x|$ is continuous at $x = 0$ [2]

    but $f'(0)$ does not exist.

2. Discuss the continuity at $x = 1$ of the function: $f(x) = \begin{cases} e^{1/(x-1)}, & x \neq 1 \\ 0, & x = 1 \end{cases}$. [2]

3. Show that the following function is continuous and differentiable at $x = 1$: [2]

    $$f(x) = \begin{cases} x^2 + 1, & x \leq 1 \\ 2x, & x > 1 \end{cases}.$$

4. Discuss the continuity and differentiability at $x = 0$ of the function: [2]

    $$f(x) = \begin{cases} x \sin \dfrac{1}{x}, & x \neq 0 \\ 0, & x = 0 \end{cases}.$$

5. Find $\dfrac{dy}{dx}$ of the following: [12]

    $(i)\ y = \tan^{-1}\left(\dfrac{1 + \tan x}{1 - \tan x}\right),\quad (ii)\ \ln(x + y) = x\,y,$

    $(iii)\ y = \sin 2 \tan^{-1}\sqrt{\dfrac{1 - x}{1 + x}},\ (iv)\ y = \left(1 + \dfrac{1}{x}\right)^x + x^{1/x},$

    $(v)\ y = (\cos x)^y + (\sin y)^x,\ (vi)\ y = (\cos x)^{\sin x} + (\sin x)^{\cos x}.$

GOOD LUCK!!!