

LEVEL 4 ASSESSMENT SPECIFICATION

Student name:		Student ID number:	
Programme:			
Module:	Analytical Methods		
Module code:	ACHA4000	Contribution to Overall Module Assessment (%):	50%
Lecturer:	Arnaud Marotin	Internal Verifier:	Richard Sutton
Assignment Title:	Class Test Resit	Word count (or equivalent):	N/A
Submission deadline:	20/07/2022	Return date of provisional marks & written feedback:	05/08/2022

TASK DESCRIPTION

Answer all 4 questions

Question 1: (30 Marks)

a) Calculate the **first** derivative of the following function u :

$$u(x) = \sqrt{3x + (3x)^2 - \frac{2}{5x^2}}$$

(10 marks)

b) Calculate the **second** derivative of the following function k :

$$k(x) = \frac{3 + x}{x^2}$$

(20 marks)

Question 2: (20 Marks)

Calculate the first derivative of the following function using the logarithmic differentiation method

$$y = \frac{e^{5x} \cdot (x + 3)}{\cos^2(x)}$$

Question 3: (15 Marks)

Let,

$$f(x, y) = y^2 \cdot \cos(3x + y)$$

Calculate:

a) $\frac{\partial f(x, y)}{\partial y}$

(5 marks)

b) $\frac{\partial^2 f(x, y)}{\partial x \partial y}$

(10 marks)

Question 4: (35 Marks)

Draw a quick sketch of the following functions f , using the indicative steps:

$$f(x) = 3x^3 + 5x^2 - 30x - 10 \text{ along } x \text{ interval } [-4.5, 3.5]$$

Step 1 (5 marks): Calculate the first derivative f' of the function f

Step 2 (5 marks): Solve $f'(x) = 0$ to locate the critical points along the x -axis

Step 3 (5 marks): Study the sign of the first derivative f' along the x -axis to understand if the function f increases or decreases on either side of the critical points

Step 4 (5 marks): Calculate the second derivative f'' of the function f

Step 5 (5 marks): Solve $f''(x) = 0$

Step 6 (5 marks): Study the sign of the second derivative f'' along the x -axis to understand *how* the function f increases or decreases

Step 7 (5 marks): Draw a quick sketch of the function f along the given interval