Mathematical Skills of Data Scientists CSCM70 Assessed Sheet 1	Name	
	Number	
Hand in ONLINE by 1 Nov 2022		

Feedback		Mark		/100
Date Marked	/ /2022	Presentation	Poor Good	Excellent

Please attach a scanned copy of your working and relevant m files of the MATLAB work

Please answer all questions, giving all the details. These questions are for hand calculations only but you can always check your answers using Matlab

1. Did you attach scanned copy of **self marked** Unassessed Assignments; UA1, UA2 and UA3? [10 Marks]

2. Consider the following system of linear equations

$$2x_1 - 2x_2 + 2x_3 = 1$$
$$-3x_1 - 6x_2 = -1$$
$$x_1 - 7x_2 + 10x_3 = 2$$

(i) Write this in a matrix form $AX = b$ and identify A, X and b.
[5 Marks]

(ii) Write the augmented matrix and find the solutions for x_1, x_2 and x_3 by converting this augmented matrix to echelon form. [15 Marks]

3. Check whether the following vectors are linearly dependent or independent. Substantiate your answers.
(i) $(1, 1, 1), (1, 2, 1), (2, 3, 4)$ in in $\mathbb{R}^3$ over $\mathbb{R}$.
(ii) $(1, -1, 1), (1, -2, 2), (2, -1, -1)$ in in $\mathbb{R}^3$ over $\mathbb{R}$.

[20 Marks]

4. Evaluate the limit, if it exists. Substantiate your answers.

(i)
$$\lim_{x \to 2} (x^2 - 4x)$$

(ii)
$$\lim_{x \to 0} \frac{|x|}{x}$$

[10 Marks]

5. Given $f(x) = x^2 - 3x$, find $\frac{df(x)}{dx}$ using the definition of derivative,

$$\frac{df(x)}{dx} = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}.$$

[10 Marks]

6. Differentiate
$$y = (x^3 + 3)^4 (2x^3 - 5)^3$$

[10 Marks]

7. Find the extrema for the following functions and classify them (as maximum or minimum).

(i)
$$f(x) = x^3 + 2x^2 - 4x - 8$$

(ii)
$$f(x) = x^3 - 6x^2 + 9x - 8$$

[20 Marks]