



**THE UNIVERSITY OF THE WEST INDIES
FIVE ISLANDS CAMPUS**

Semester II

Examinations of April/May 2022

Course Code:	ECON1003
Course Title:	Mathematics for Social Sciences I
Date of Assessment:	Wednesday May 04, 2022
Time:	1:00pm – 3:00pm
Duration:	2 hours

INSTRUCTIONS TO CANDIDATES:

This paper has **3** pages and **6** questions.

YOU ARE REQUIRED TO ANSWER SIX (6) QUESTIONS.

THIS ASSESSMENT IS WORTH 60 % OF YOUR FINAL GRADE.

ASSIGNMENT DETAILS FROM INSTRUCTORS:

- **This paper contains six questions**
- **Each question is worth 10 marks**
- **Students are required to answer all questions**
- **Show all working clearly for each question**
- **The total marks is sixty (60) marks**

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STUDENTS ARE REQUIRED TO ANSWER ALL QUESTIONS

1. Suppose the cost function associated with **JAM Me** frozen tropical ice cream bars manufactured at the Food Processing Plant at Friars Hill Road is defined as

$$C(x) = \frac{12x + 1}{x - 5}$$

Where x denotes the number of **cases** of 40 bars manufactured per day

- (a) Find the cost in XCD \$ of producing 100 **cases** of ice cream bars [2 marks]
- (b) Find the cost in XCD \$ of producing 300 **cases** of ice cream bars [2 marks]
- (c) Of this cost, which is more economical? Provide a reason to support your response [1 mark]
- (d) Find the expression that corresponds to $C^{-1}(x)$ [3 marks]
- (e) Given the following two functions $f(x) = 5x^2 + 2x - 1$ and $g(x) = x + 5$.
Find an expression for $fg(x)$ [2 marks]
2. Stocks of INET Telecommunications are initially auctioned at the price of \$50 US.
The value of the stock grows by 5% every year.
- (a) Show that the value of a stock follows a geometric sequence. [5 marks]
- (b) Calculate the value of the stock ten years after the initial auction. [2 marks]
- (c) Given two terms in a geometric sequence find the 8th term and the recursive formula.
 $a_4 = -10$ and $a_5 = -5$ [3 marks]
3. A function $f(x)$ is defined as

$$\begin{cases} 6 + 4x & \text{if } x < 2 \\ 6x^2 - 10 & \text{if } x \geq 2 \end{cases}$$

- (a) Determine whether $f(x)$ is continuous at $x = 2$ [4 marks]
- (b) Evaluate the following limits

(i) $\lim_{x \rightarrow -2} \frac{4-x^2}{x+2}$ [3 marks]

(ii) $\lim_{x \rightarrow \infty} \frac{10-15x^2-7x^3}{2x^3-30x^2+11x+4}$ [3 marks]

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4. *Antigua Tropical Tasty Delights* company's total revenue function in thousands of dollars is given by $R(x) = 24x - x^2 + 125$ where x represents the level of demand for its product **JAM ME** tropical ice cream bar.



- (i) Write down an expression for the marginal revenue function [3 marks]
- (ii) Find the value of x for which the revenue will be maximized (Hint: use the 2nd derivative test) [4 marks]
- (iii) If the cost function is given by $C(x) = 24x - 5x^2 + 100$, find the function that represents the profit, $P(x) = R(x) - C(x)$ [2 marks]
- (iv) Using your answer from (ii) evaluate the maximum profit [1 mark]
5. Evaluate the following integrals
- (a) $\int 3x^5 - 2x^3 + \frac{1}{x^2} dx$ [3 marks]
- (b) $\int_0^1 (4x^2 - 1)^2 2x dx$ Hint: consider the u-substitution method [4 marks]
- (c) The marginal cost function of a firm is given by $C'(x) = 40x + 15x^2$. Find the total cost function $C(x)$ given that $C(10) = 27000$ [3 marks]

6. (a) In the following question select **True** or **False** for each answer

- (i) If A and B are two matrices, $AB = BA$ [1 mark]
- (ii) Given $A = \begin{pmatrix} 3 & 2 & 1 \\ -1 & 4 & 5 \end{pmatrix}$ then $A^T = \begin{pmatrix} 3 & -1 \\ 2 & 4 \\ 1 & 5 \end{pmatrix}$ [1 mark]
- (iii) For any matrix A , $(A^T)^T = A$ [1 mark]

- (b) Consider the system of linear equations

$$\begin{aligned} 2x - 3y &= 1 \\ -2x + 4y &= 6 \end{aligned}$$

- (i) Write the system of linear equations below in matrix form $AX = b$ [2 marks]
- (ii) Hence using Cramer's method, show that the solution of the equations is $x = 11$ and $y = 7$ [5 marks]

END OF QUESTION PAPER