



**SIR ARTHUR LEWIS COMMUNITY COLLEGE
ACADEMIC YEAR (2024/2025) - SEMESTER ONE
END OF SEMESTER ALTERNATE EXAMINATION**

COURSE TITLE : MATHEMATICS FOR BUSINESS

COURST CODE : MAT 106

**LECTURER : VERCILLI GUSTAVE-LORD
CARON SERIEUX**

DATE : 17th January 2025

TIME : 9:00 a.m.

DURATION : 2 HRS

STUDENT ID# :

READ THE FOLLOWING INSTRUCTIONS CAREFULLY.

1. Write your student's ID number on all the work you hand in.
2. This paper consists of three (3) sections, A, B, C.
3. Answer ***all*** the questions in ***all*** section.
4. A formula sheet is included.
5. Write in BLACK or BLUE pen.
6. Show all calculations and working.
7. **Only NON-PROGRAMMABLE calculators are permitted.**
8. Do not use correction fluid.

DO NOT TURN THIS PAGE UNTIL YOU ARE TOLD TO DO SO

Formulae

- Quadratic Formula:

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

- Arithmetic Sequences and Series

$$a_n = a_1 + (n - 1)d$$

$$S_n = \frac{n}{2} [2a_1 + (n - 1)d]$$

- Geometric Sequence and Series

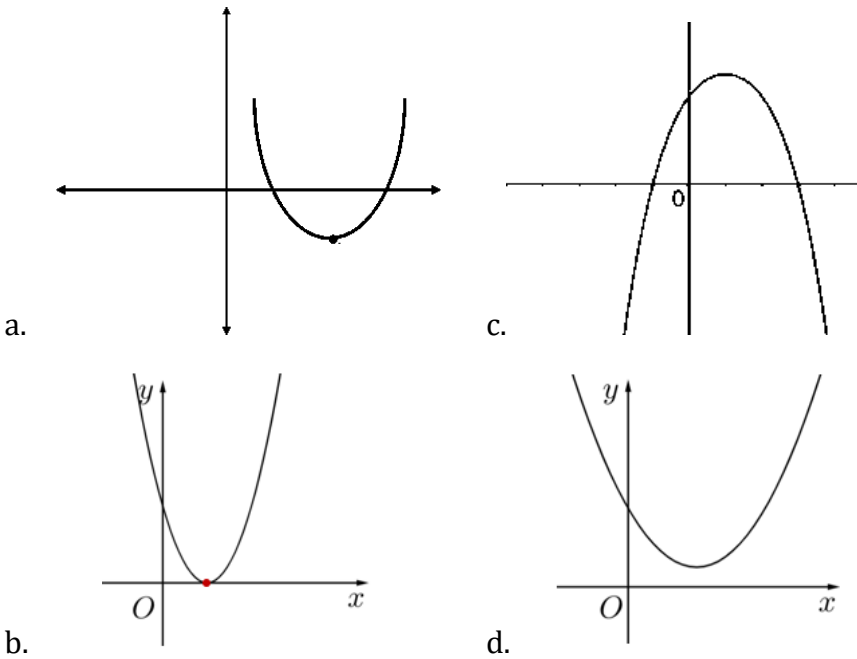
$$a_n = a_1 r^{n-1}$$

$$S_n = \frac{a_1(r^n - 1)}{r - 1}$$

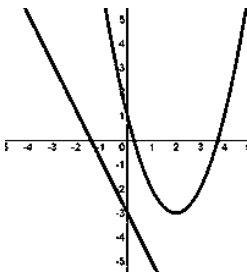
SECTION A

Instructions: *Shade the letter corresponding to the correct answer on the question paper.*

1. What is the value of the discriminant in $y = 3x^2 - 4x + 2$
- a. 24 b) -24 c) -8 d) 8
2. The equation $y = 3x^2 - 4x + 1$ has
- a. no real roots c. one real root (repeated roots)
- b. one real and one imaginary root d. two distinct real roots
3. What are the roots of the quadratic equation $2x^2 - 7x - 3 = 0$?
- a. $3, \frac{1}{2}$ b) $-3, \frac{-1}{2}$ c) $2, \frac{-1}{3}$ d) $-2, \frac{1}{3}$
4. Which of the following is the *most likely* graph of $y = x^2 - 8x + 12$?



5. The graph shown below is best described as a/an



- a. Consistent independent system c. Consistent dependent system
- b. Inconsistent system d. Inconsistent dependent system
6. Which set of values given in the options below is a solution to the system

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

- a. (-2, -1, 3) b. (-1, 2, 2) c. (1, -1, 2) d. (2, -3, 1)

7. Which expression is a polynomial?

- a. $\frac{3x}{x^2+2x+7}$ b. $3xy + 2\sqrt{x} + 5y$ c. $(3x + 5x^2 - 4)^3$ d. $3x - 4x^{-3} + 2x^2$

8. A student sets up a synthetic division of polynomials as follows:

$$\begin{array}{r|rrrrr} -4 & 3 & 12 & -5 & -18 & 8 \\ & & -12 & 0 & 20 & -8 \\ \hline & 3 & 0 & -5 & 2 & 0 \end{array}$$

What expression below represents the quotient?

- a. $x + 4$ b. $3x^4 + 12x^3 - 5x^2 - 18x + 8$ c. $3x^3 - 5x + 2$ d. $-12x^3 + 20x - 8$

9. Find m so that $x + 3$ is a factor of $f(x) = 3x^2 + mx + 6$.

- a. 7 b. 11 c. 21 d. 33

10. What is the remainder when $f(x) = 2x^2 - 16x + 4$ is divided by $(x + 1)$.

- a. 22 b. 20 c. -10 d. 10

11. Given $8^{2x} = 16^{x+2}$, $x =$

- a. 2 b. 6 c. 4 d. 1/2

12. Evaluate $\log_4 205$

- a. 0.58 b. 2.31 c. 123.42 d. 3.84

13. Find the 10th term of the sequence 1, 2, 4, 8...

- a. 19 b. 512 c. 1024 d. 256

14. Find the 99th term of the sequence 3, 7, 11, 15, ...

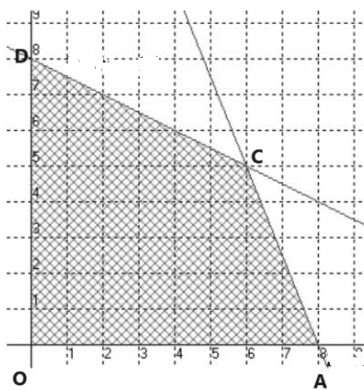
- a. 395 b. 391 c. 399 d. 387

15. Given the matrix $\begin{bmatrix} 2 & 7 & -5 \\ 6 & 4 & 8 \\ 9 & -3 & 1 \end{bmatrix}$, the cofactor of the element 2 is:

- a. $\begin{bmatrix} 6 & 4 \\ 9 & -3 \end{bmatrix}$ b. $\begin{bmatrix} 6 & 8 \\ 9 & 1 \end{bmatrix}$ c. $\begin{bmatrix} 4 & 8 \\ -3 & 1 \end{bmatrix}$ d. $\begin{bmatrix} 7 & -5 \\ -3 & 1 \end{bmatrix}$

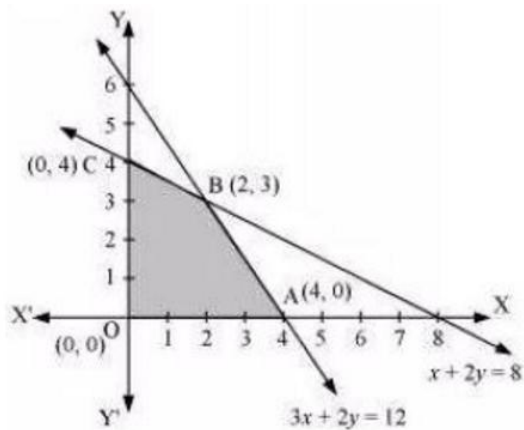
SECTION B

16. The set of all points that satisfy a system of inequations is known as the [1]
17. The maximum value of the system in the figure below given the objective function $P = 5x - 2y$ can be found at the point



..... [1]

18. The shaded region in the figure below shows the solution to a system of inequations. Write the inequations in this system in the space below.



..... [1]

19. A bicycle store sells mountain bikes and street bikes. Mountain bikes sell for \$220 and street bikes for \$180. The profit on each mountain bike is \$50 and the profit on each street bike is \$40. The store maintains an inventory of at least twice the number of mountain bikes as street bikes. The inventory is at most 400 bikes. The store manager wishes to target monthly sales of at least \$80,000.
- Let x represent the number of mountain bikes and y represent the number of street bikes in store.*

- a. State the objective function representing the monthly maximum profit
- [1]
- b. Write down ONE inequation representing a constraint described in this problem
- (excluding the non-negative constraints).*
- [1]

SECTION C

Instructions:

- *Answer ALL questions in the space provided.*
- *Show ALL necessary working.*
- *Give non-exact answers correct to 2 decimal places.*

1. (a) Mickey Pets is a company that makes electronic pets. The profits of the store are given by the equation below, where x is the number of pets sold each week.

$$P(x) = -x^2 + 980x - 3000.$$

Determine:

- i) The number of pets that must be sold weekly to maximize profit. [2]

- ii) The maximum weekly profit. [3]

- (b) Use long division to divide:

$$3x^3 + 5x^2 - 4x - 4 \div (3x + 2) \quad [4]$$

- (c) Ava goes to the super market with ten dollars. She observes that she has some choices about what to buy. She could get one apple, one banana and one coconut for 9 dollars. She could get two apples and two bananas for 10 dollars. She could also get two bananas and one coconut for 10 dollars. Write and solve a system of equations to find the unit cost of each of the three things she can buy. [6]

Total 15 marks

2. (a) Solve: $3^{x-1} = 11$ [3]

- (b) The sum of the first n terms of an Arithmetic Progression is given by $S_n = n(3n - 4)$. Find the first, second, and third terms. [4]

(c) A system of equations is given as

$$x - y + 2z = 6$$

$$2x + y + z = 3$$

$$3x - y + z = 6$$

i) Write the system of equations in Matrix form as $AX = B$ [2]

ii) Evaluate the determinant of Matrix A using the method of cofactors. [3]

iii) Hence find the value of x using Cramer's Rule [3]

Total 15 marks

END OF EXAMINATION