

**SIR ARTHUR LEWIS COMMUNITY COLLEGE
SCIENCE, TECHNOLOGY, INNOVATION AND SUSTAINABILITY**

**2024 – 2025 ACADEMIC YEAR - SEMESTER I
END OF SEMESTER EXAMINATION**

COURSE TITLE : **MATHEMATICS FOR BUSINESS**

COURST CODE : **MAT106**

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

DATE : **Tuesday 17th December 2024**

TIME : **1.00 – 3.00 PM**

DURATION : **2 HRS**

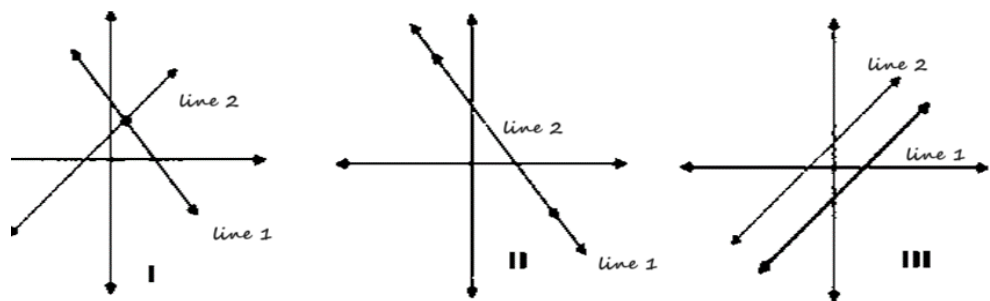
STUDENT ID# : **.....**

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 THE PAGE UNTIL YOU ARE TOLD TO DO SO

5. Which of the diagrams below shows a consistent dependent system:



- a. I only b. II only c. III only d. II and III only
6. Which set of values given in the options below is a solution to the system:

$$\begin{aligned} 2x + y + z &= 11 \\ 3x + 2y - z &= 8 \\ x + 5y - 2z &= 9 \end{aligned}$$

- a. (1, 2, 3) b. (2, 3, 4) c. (3, -5, 1) d. (2,-3, 1)

7. Given $2 \times 8^{2x} = 16$, $x =$

- a. $\frac{3}{4}$ b. $\frac{1}{2}$ c. $\frac{1}{4}$ d. 1

8. Evaluate $\log_5 8$

- a. 0.77 b. 1.18 c. 1.23 d. 1.29

9. Which expression is a polynomial?

- a. $\frac{8xy+4}{7}$ b. $2x^2y + 4\sqrt{5x} + 2y$ c. $(p + 5p^2 - 1)^{\frac{1}{4}}$ d. $4x^4 - 2x^3 + 2x^{-2}$

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

$$\begin{array}{r|rrrr} -2 & 1 & 2 & -4 & 8 \\ & & -2 & 0 & 8 \\ \hline & 1 & 0 & -4 & 16 \end{array}$$

What expression below represents the dividend?

- a. $-2x^2 + 0x + 8$ b. $1x^3 + 2x^2 - 4x + 8$ c. $1x^2 - 4$ d. $1x^2 - 4x + 16$
11. Find m so that $x - 5$ is a factor of $f(x) = x^2 + px - 40$.
- a. 3 b. -3 c. 5 d. -8

12. What is the remainder when $f(x) = 2x^2 - x^3 + 3$ is divided by $(x - 3)$.

- a. 2 b. -2 c. -6 d. 48

13. Find the 7th term of the sequence 2, 6, 18, 54,
- a. 243 b. 486 c. 729 d. 1458

14. Find the 65th term of the sequence 25, 22, 19, 16, 13, ...
- a. 167 b. 192 c. -167 d. -192

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

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

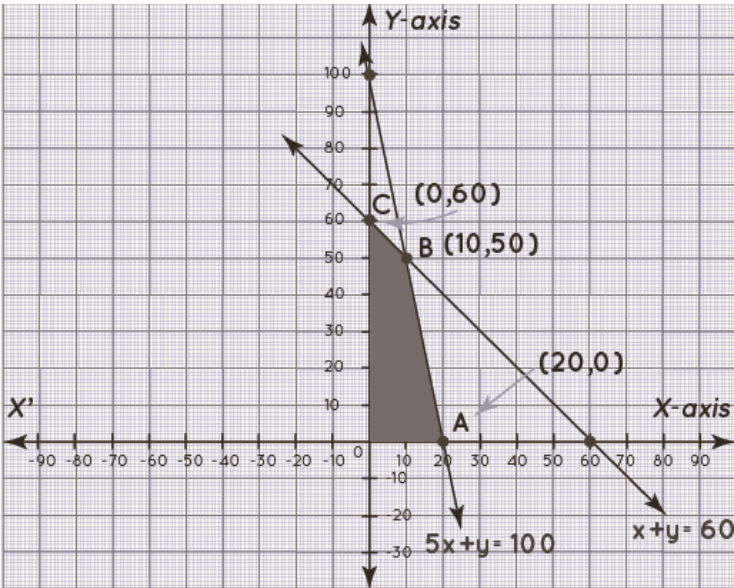
SECTION B

Instructions: *Write your answer in the space provided*

16. The set of all points that satisfy the constraints in a linear programming problem is called the

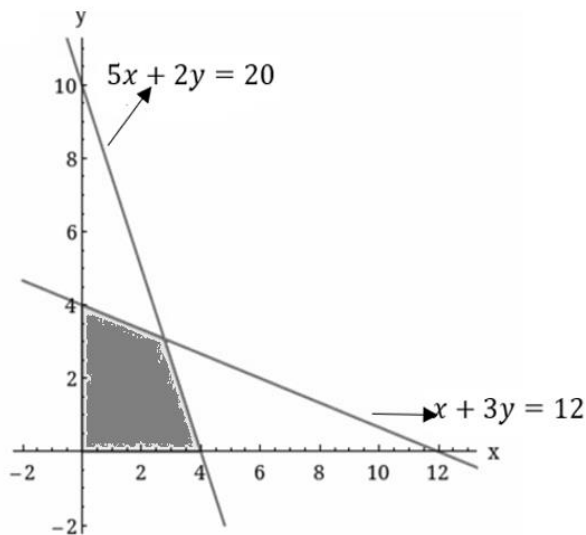
..... [1]

17. State the maximum value of the system in the figure below given the objective function $Z = 5x + 7y$ is



..... [1]

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



.....
 [1]

19. A small business rents two types of watercraft, canoes and kayaks. \$45,000 has been allocated to purchase new canoes and kayaks. A new canoe costs \$600 and rents for \$25 a day while a new kayak costs \$750 and rents for \$30 a day. The business can only store 65 additional watercrafts.

Let x represent the number of canoes and y the number of kayaks.

(a) Write down the objective function representing the daily revenue from renting the canoes and kayaks:
 [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) The profit, P , (in thousands of dollars) of a company is given by the equation:

$$P(x) = 5000 + 1000x - 5x^2,$$
 where x is the amount (in thousands of dollars) the company spends on advertising.

i) Find the amount, x , the company must spend to maximise profit [2]

ii) Find the maximum profit. [3]

(b) Perform the operation

$$x^3 - 14x^2 + 100 \div x - 5. \quad [4]$$

(c) Thomas took in a total of \$1240 last week from the rental of three cars, a Nissan, a Toyota and a Suzuki. He had to pay 10% of the rental fee from the Nissan for repairs, 20% of the rental fee from the Toyota for repairs and 30% of the rental fee from the Suzuki for repairs. If the Suzuki rents for twice as much as the Nissan and the total repair bill was \$276, determine the amount collected in rent for each vehicle. [6]

Total 15 marks

2. (a) Solve: $5^{x+4} = 13^{3x}$ [3]

(b) A small business owner purchased a piece of machinery worth \$120,000 on January 01, 2024. The value of this item depreciates at a rate of 75% of its previous value per year after purchase. What will be the value of this piece of machinery on January 01, 2029? [3]

(c) A system of equations is given as

$$-x + 4y + 3z = 2$$

$$2y + 2z = 1$$

$$x - 3y + 5z = 0$$

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 z using Cramer's Rule [4]

Total 15 marks

END OF EXAMINATION