SIR ARTHUR LEWIS COMMUNITY COLLEGE

ACADEMIC YEAR (2024/2025) – SEMESTER TWO

END OF SEMESTER EXAMINATION

COURSE CODE	:	**MAT 142**
COURSE TITLE	:	**Algebra Essentials**
LECTURER	:	**Pascalina Stanislas-Inglis, Antonia Laurent Goodman**
DATE	:	**May 5, 2025**
TIME	:	**9:00 a.m.**
DURATION	:	**2 hours**
STUDENT ID #	:	_____

GENERAL INFORMATION AND INSTRUCTIONS

- Students must sign **IN** and **OUT** on the examination class list.
- Write your ID number on the question paper.
- There are seven (7) questions in this exam. Answer all questions in the spaces provided.
- Use blue or black pen.
- Non-programmable calculators are permitted.

Question	Student's mark	Moderated Mark	Max Score
1			16
2			6
3			8
4			7
5			12
6			10
7			17
TOTAL			**76**

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

Instruction: Answer all questions in the space provided.

1. Given that $f(x) = 2x^3 + ax^2 + bx - 6$ gives a remainder of -6 when divided by $(x + 1)$. Given also that $(x + 2)$ is a factor of $f(x)$,

   (a) Find the values of a *and* b [9]

   (b) Hence, using algebra, write $f(x)$ as a product of three linear factors [4]

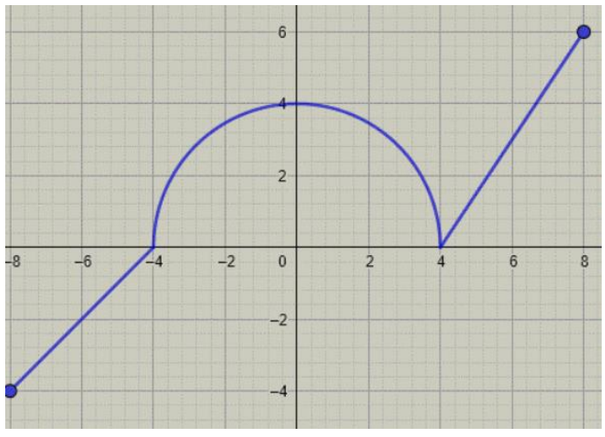
   (c) Solve $f(x) = 0$ [3]

2. A drone is ascending with its height given by $h(t) = 3t - 0.2t^2$, where t is time in minutes and h(t) is height in meters.

   (a) Determine the average rate of change of the drone's height from 8 to 9 minutes into its ascent. [5]

   (b) Include units and explain the significance of this rate in the context of drone flight. [1]

3.

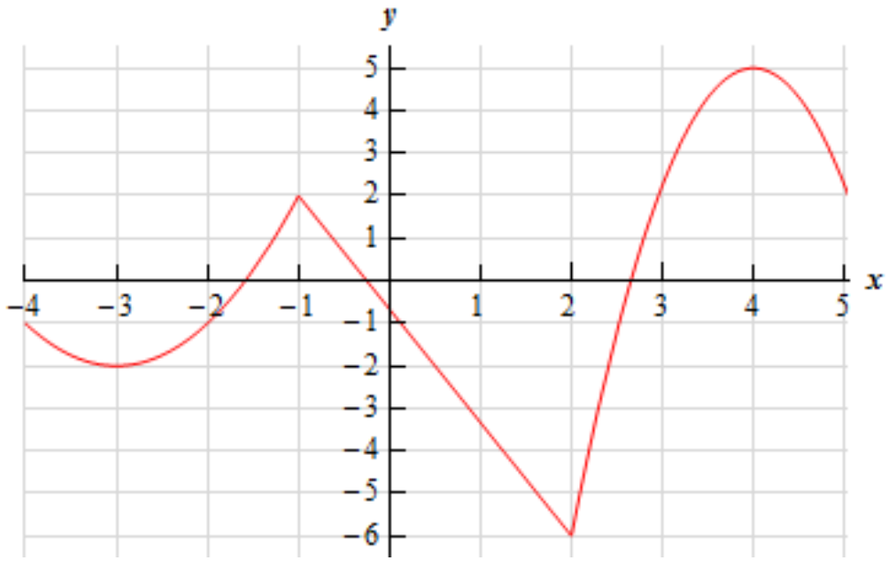


   (a) State the domain and range of the function graphed above, using interval notation. [4]

   Domain _____

   Range _____

(b) Given the function in the image below



Identify

a. Local maximum_____

[1]

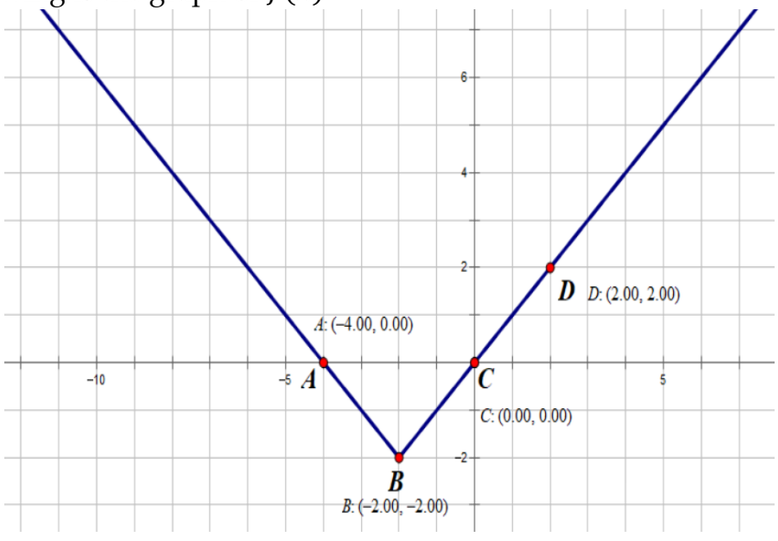
b. Interval where the function is increasing. Give your answer in interval notation

_____ [2]

c. Absolute maximum point. _____ [1]

4.

(c) The following is the graph of $f(x)$



a) On the graph above draw clearly the graph of $f(x) + 3$ [2]

b) Describe the transformation of $f(x)$ to $g(x) = 3f(x-1) - 2$ [3]

c) The point $(-6, 2)$ on $f(x)$ is transformed to (__ , ___) on $g(x)$ [2]

5. Given are the functions $f(x) = 2x - 1$, $g(x) = x^2 + 1$ and $h(x) = \frac{5+2x}{x-3}$ $x \neq 3$

(i) Find a simplified expression for the composite function $fg(x)$ [3]

(ii) Hence, solve $fg(x) = f(x) + 6$ [5]

(iii) Determine $h^{-1}(x)$ [4]

6. Solve the following

a) $3 - 5|2x - 3| = -7$ [5]

b) $2|x - 2| \leq 4$ (represent your solution on a number line) [5]

7. (a) A new antibiotic is tested by spraying it on a lab dish covered in bacteria. Initially 12000 bacteria were placed on the dish and 24 hours later this number has fallen to 2000. The number of bacteria N on this lab dish reduces according to the equation

$$N = Ae^{-kt}, t \geq 0,$$

Where t is the time taken in hours since the bacteria was first on the dish and A *and* k are positive constants.

(i) Show that $k = 0.07466,$ correct to 4 significant figures [4]

(ii) Find the value of t when the bacteria will reach 1000? [5]

(b) Solve the following:

(i) $25^{3x-1} = \frac{1}{5}$ [4]

(ii) $log_2(2x) = log_2(5x + 4) - 3$ [4]

END OF EXAMINATION