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

COURSE TITLE : **ALGEBRA ESSENTIALS**

COURST CODE : **MAT 142**

LECTURER : **ALLISON DRYSDALE-FELIX**
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PETRUS JN FRANCOIS

DATE : **16th 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 **SEVEN (7)** questions
3. Answer ***all*** the questions in the space provided
4. Write in BLACK or BLUE pen. ***(NO WRITING IN PENCIL)***
5. Show all calculations and working.
6. **Only NON-PROGRAMMABLE calculators are permitted**.
7. Do not use correction fluid.

Question	Student's mark	Max Score
1		10
2		10
3		6
4		7
5		10
6		8
7		13
TOTAL		**64**

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

1. Given that $f(x) = 2x^3 + x^2 - 13 + 6$

   (a) Use the factor theorem to show that $(2x - 1)$ is a factor of $f(x)$ [3]

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

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

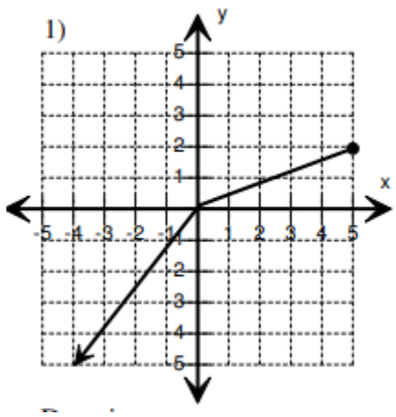
2.

   (a) Write a relation, as a set of ordered pairs, which is **not** a function. [1]

   (b) Given that $f(x) = 3x^2 - 8x$, $g(x) = 2x^2 - 5x - 3$ and $h(x) = \frac{f(x)}{g(x)}$, solve $f(x) = 0$ [3]

(c) State why $x = 3$ cannot be in the domain of $h(x)$. [1]

1)



(d) State the domain and range of the function graphed above, using interval notation. [2]

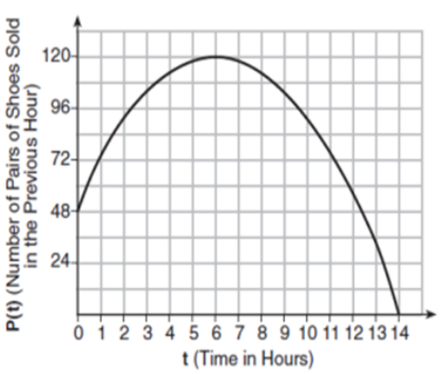
Domain _____

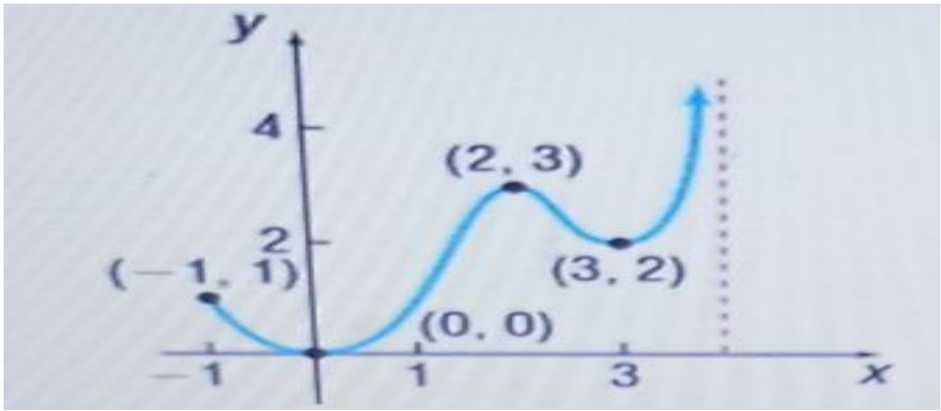
Range _____

(e) Given $m(x) = \begin{cases} -11x^2 + 11x, & if\ x < 12 \\ -12x - 4, & if\ x = 12, \\ -19, & if\ x > 12 \end{cases}$

find $m(12.5)$. [1]

(f) A manger wanted to analyze the online shoe sales for his business. He collected data for the number of pairs of shoes sold each hour over a $14-$ hour time period. He created a graph to model the data, as shown below. Determine the average rate of change in shoe sales between the sixth and fourteenth hours. [2]





3. For the graph given **above**, state the following:

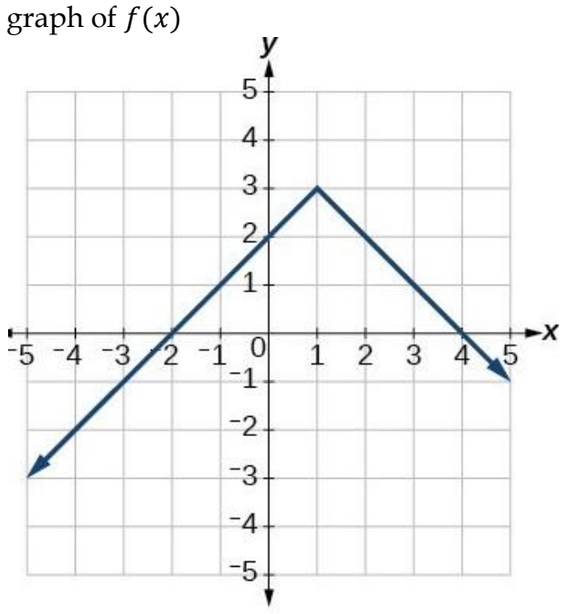
   a. The local minimum points have x coordinates of _____ and _____. [2]

   b. The local maxima occurs at y = _____ [1]

   c. The absolute minimum point is (,)
   [1]

   d. State the interval in which the above graph is increasing. Give your answer in **interval notation**.
   [2]

4. The following is the graph of $f(x)$



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

   b) Describe the transformation of $f(x)$ to $g(x) = 4f(x-1) + 3$ [3]

   c) The point $(1, 3)$ on $f(x)$ is transformed to (__ , ___) on $g(x)$ [2]

5. Given are the functions $f(x) = 3x + 1$, $g(x) = x^2 + 2$ and $h(x) = \frac{7-2x}{x-5}$ $x \neq 5$

(i) Find a simplified expression for the composite function $fg(x)$ [2]

(ii) Hence, solve $fg(x) = f(x) + 12$ [4]

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

6. Solve the following

a) $2 - 5|x - 7| = -3$ [4]

b) $|11x - 9| \leq 13$ [4]

7.

(a) James is studying the black bear population at a large national park. He finds that the relationship between the elapsed time t, in years, since the beginning of the study, and the black bear population $B(t)$, in the park is modelled by the following function.

$$B(t) = 2500e^{0.01t}$$

(i) According to the model, what will the black bear population be at that national park in 25 years? [2]

(ii) After how long will the black bear population reach 500? Give your answer to the nearest whole number. [4]

(b) Solve the following:

(i) $49^{3x-2} = \frac{1}{7}$ [3]

(ii) $log_3(10 - x) = 2 + log_3 x$ [4]

END OF EXAMINATION