Examination	Final Exam
Course Code	MAT 142
Course Name	Algebra Essentials
Lecturers	Allison Drysdale-Felix Antonia Laurent Goodman Johann Nathaniel Petrus Jn. Francois
Duration	2 hours

Student ID ______________________________

Instructions

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

1. Given that $f(x) = 6x^3 + 17x^2 + 4x - 12$

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

(b) Hence, using algebra, write $f(x)$ as a product of three linear factors [5]

(c) Solve $f(x) = 0$ [2]

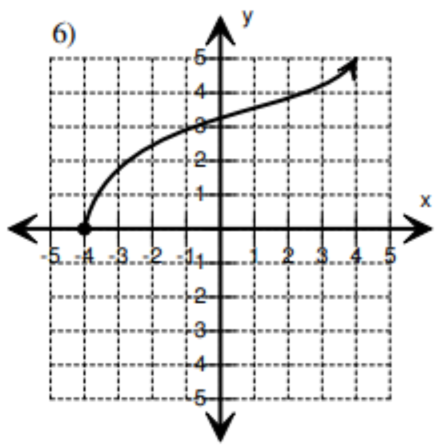
2.

(a) Determine whether the relation $\{(2,2), (-1,5), (5,2), (2,4)\}$ is a function. [1]

(b) Given that $f(x) = 6x^2 - 3x$, $g(x) = x^2 + 7x + 12$ and $h(x) = \frac{f(x)}{g(x)}$

(i) solve $f(x) = 0$ [3]

(ii) state why $x = -3$ cannot be in the domain of $h(x)$. [1]



(c) State the domain and range of the graph above, using **interval notation.**

Domain ______________________

Range ________________________

[2]

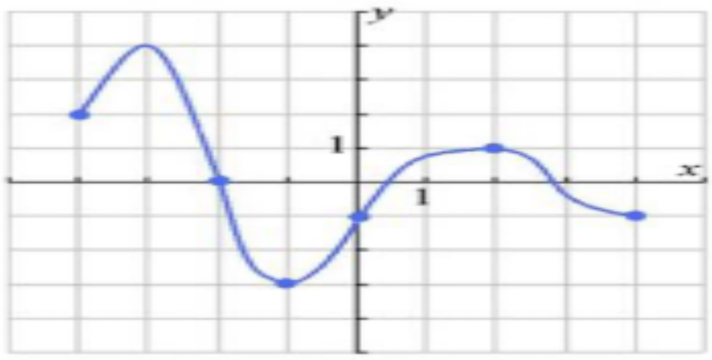
(d) Given $m(x) = \begin{cases} 10, & if\ \ x < -4 \\ 16, & if -4\ \leq x\ \leq 9, \\ -13, & if\ \ x > 9 \end{cases}$

find $m(6)$. [1]

(e) Jan recorded temperatures over a 24 – hour period one day in August in her hometown. Her results are shown in the table below.

Time (hours)	0	3	6	9	12	15	18	21	24
Temperature (°F)	80	75	70	78	92	89	85	80	74

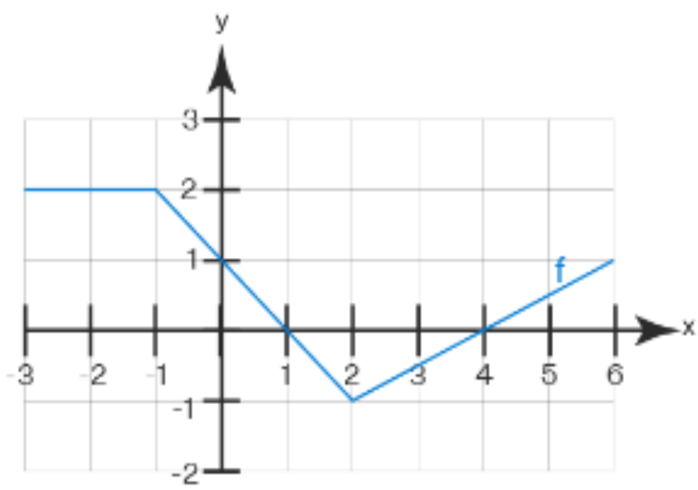
Find the average rate of change of temperature from hour 12 to hour 24. [2]



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

(i) The local maximum points have x coordinates of ______ and ______. [2]
(ii) The local minima occurs at y = ________ [1]
(iii) The absolute maximum point is (,) [1]
(iv) 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 $f(x) + 1$ [2]

b) Describe the transformation of $f(x)$ to $g(x) = 2f(x + 4) - 1$ [3]

c) The point $(1, 0)$ on $f(x)$ is transformed to (__ , __) on $g(x)$ [2]

5. Given are the functions $f(x) = 2x + 1$, $g(x) = x^2 - 2$ and $h(x) = \frac{10-x}{x-3}$ $x \neq 3$

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

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

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

6. Solve the following

a) $3|x - 1| - 2 = 7$ [4]

b) $|2x - 5| \geq 11$ [4]

7. A video posted on YouTube initially had 80 views as soon as it was posted. The total number of views to date has been increasing exponentially according to the exponential growth function $y = 80e^{0.2t}$, where t represents the time measured in days since the video was posted and y represents the number of people that viewed the video.

   a) How many views did the video have after ten (10) days? [2]

   b) How many days does it take until 2500 people have viewed this video? Give your answer to one decimal place. [4]

(c) Solve the following:

   i. $9^{5x+2} = 27$ [3]

ii. $\log(x + 15) - 1 = \log(x + 6)$ [4]

END OF EXAMINATION