APPLECROSS
SENIOR HIGH SCHOOL

Year 11 Mathematics
METHODS UNIT 1

TEST 2
TERM 1, 2019
Test Date: Thursday, 28 March

Name: _____

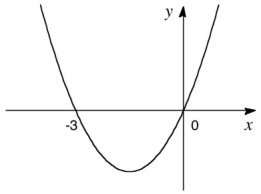
All working is to be shown in the space provided. Your working should be in sufficient detail to allow your answers to be checked readily so part marks may be awarded if the answer is incorrect. For any question worth more than 2 marks valid working or justification must be shown to be awarded full marks.

		Total	
Section 1		24	%
Section 2		31	
Total		55	

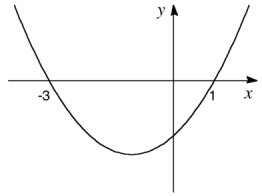
SECTION 1 – Resource Free Working Time: 25 minutes

Question 1 **(3 marks)**

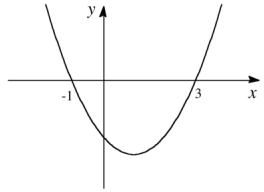
Shown are eight quadratic functions, numbered 1 to 8, and five graphs, lettered A to E.
Each graph corresponds to one of the functions. Decide which function goes with which graph.
You will have three functions left over.



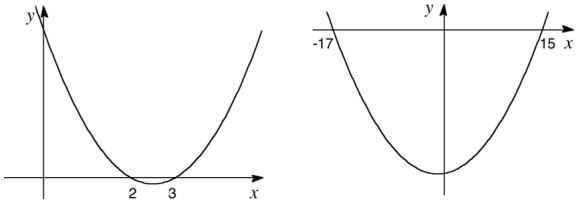
A _____



B _____



C _____



E _____

D _____

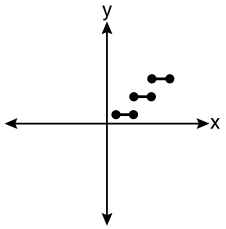
1 $y = x^2 + 3x$
2 $y = (x-1)(x+3)$
3 $y = (x+17)(x-15)$
4 $y = (x+2)(x+3)$
5 $y = (x-17)(x+15)$
6 $y = x^2 - 5x + 6$
7 $y = (x+1)(x-3)$
8 $y = x(x-3)$

Question 2 **(5 marks)**

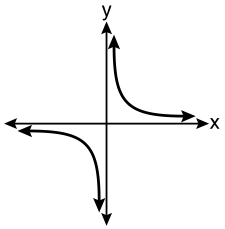
Circle the correct answer for the following questions:

(a) Which represents a relation that is not a function? (1 mark)

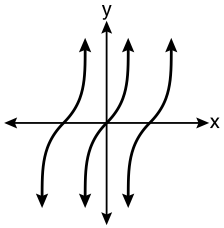
A



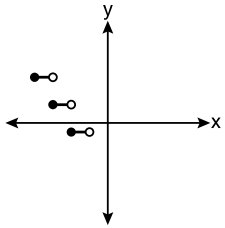
B



C

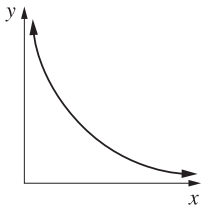


D

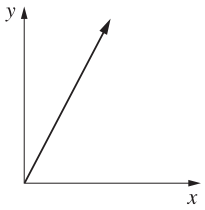


(b) Which graph shows that y is directly proportional to x? (1 mark)

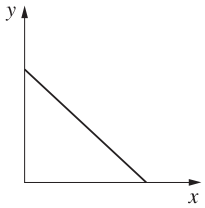
A



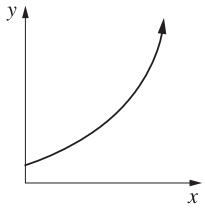
B



C

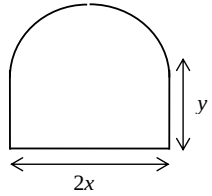


D



Question 9 **(9 marks)**

A window pane is to be made from 12 metres of steel.
The pane is to have a rectangular base and a semi-circular top as shown.



If the base of the pane is $2x$ metres and the side y metres then:

(a) show that $y = 6 - x - \frac{\pi}{2}x$. (2 marks)

(b) show that the area enclosed by the pane is given by $A(x) = 12x - 2x^2 - \frac{\pi}{2}x^2$. (3 marks)

(c) calculate the maximum area enclosed by the pane, and the length of the base and side that gives the maximum area. State all answers correct to 1 decimal place. (4 marks)

End of Calculator Assumed Section

Question 8 **(9 marks)**

(a) Show that the lines $y+2x=3$ and $2y-x=1$ are perpendicular. At what point do they intersect? (3 marks)

(b) Determine the equation of the line, having an x-intercept of -4, and which is parallel to the line connecting the turning point of $y=(x+1)^2+3$ with $(3, 7)$. (3 marks)

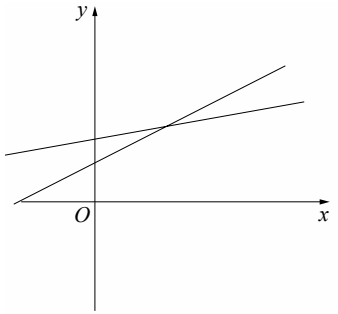
(c) The line with an angle of inclination to the positive x axis of 135° and y intercept of $-\frac{1}{2}$.

State your answer in the form $ax+by=c$, where a, b and c are integers. (3 marks)

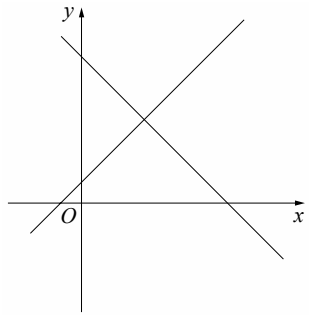
(c) George drew a correct diagram that gave the solution to the simultaneous equations $y=2x-5$ and $y=x+6$.

Which diagram did he draw? (1 mark)

A



B



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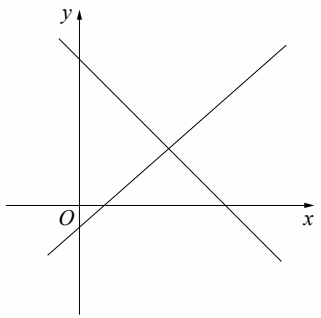
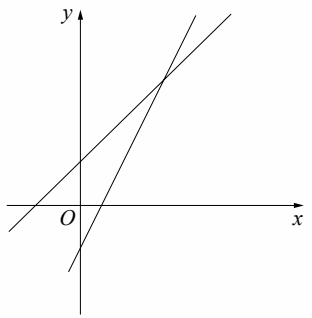


D



(d) Which equation represents the relationship between x and y in this table? (1 mark)

x	0	2	4	6	8
y	1	2	3	4	5

A $y=2x+1$

B $y=2x-2$

C $y=\frac{x}{2}-2$

D $y=\frac{x}{2}+1$

(e) For the graph $y = ax^2 + bx + c$, if a and c are both positive, which of the following statements is true. (1 mark)

A The graph will have a minimum turning point, and a positive y-intercept.

B The graph will have a maximum turning point, and a positive y-intercept.

C The graph will have a maximum turning point, and has two positive x intercepts.

D The graph will have a minimum turning point, and a negative y-intercept.

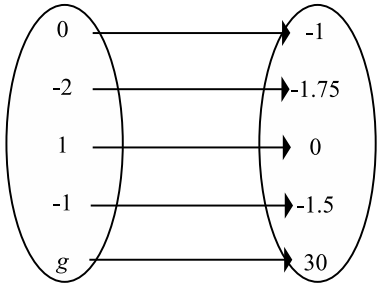
Question 3 **(2 marks)**

The linear function $f(x) = 4 - x$ has range $-2 \leq f(x) < 6$.

Determine the domain of the function.

Question 7 **(7 marks)**

The mapping below is of the form $f : x \to a \times 2^x + b$ and maps the elements of x to elements of y.



(a) List the elements in the domain of $f(x)$. (1 mark)

(b) List the elements in the range of $f(x)$. (1 mark)

(c) Find a and b. (3 marks)

(d) Find the value of g. (2 marks)

APPLECROSS SENIOR HIGH SCHOOL

Year 11 Mathematics
METHODS UNIT 1

TEST 2
TERM 1, 2019
Test Date: Thursday, 28 March

Name: _____

Equipment Allowed:

- Notes on 1 A4 page (both sides)
- ClassPad, pens and pencils
- Formula Sheet

All working is to be shown in the space provided. Your working should be in sufficient detail to allow your answers to be checked readily so part marks may be awarded if the answer is incorrect. For any question worth more than 2 marks valid working or justification must be shown to be awarded full marks.

SECTION 2 – Resource Rich Working Time: 30 minutes

Question 6 **(6 marks)**

An air balloon leaves its base at 12 noon and is moving such that its height, h metres, above sea-level at any time t hours, after 12 noon, is given as

$$h(t) = -\frac{3}{4}(t+1)(t-16) \quad \text{for } 0 \le t \le 20$$

Determine:

(a) the initial height above sea-level. (1 mark)

(b) the maximum height, correct to one decimal place, to which the balloon rises. (1 mark)

(c) the minimum height to which the balloon sinks over the time interval. (2 marks)

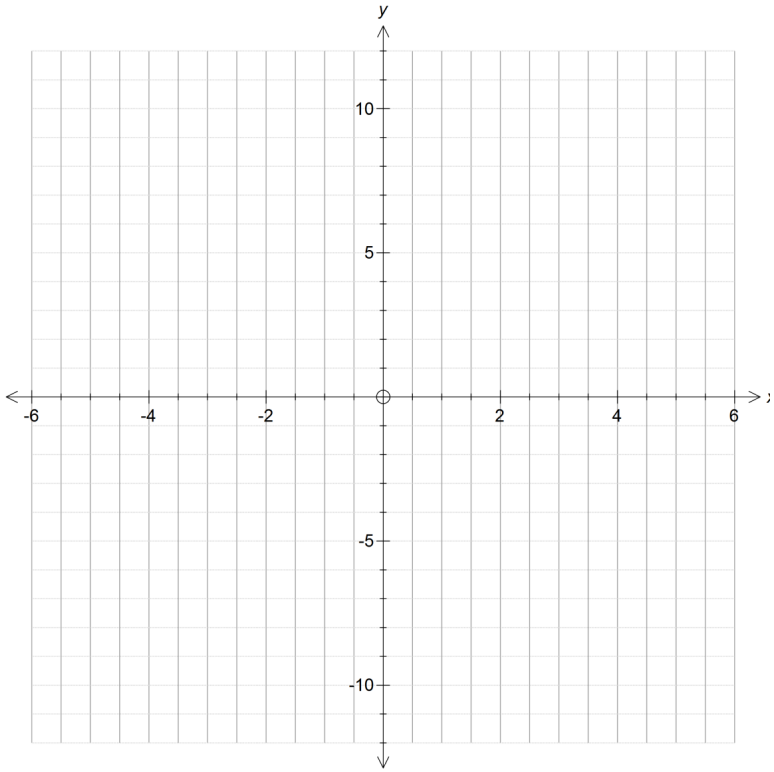
The balloon is to manoeuvre over a building of height 30 metres above sea level.

(d) During what times, correct to two decimal places, will it be able to do this? (2 marks)

Question 4 **(6 marks)**

(a) Complete the square for $x^2 - 6x + 10$. (2 marks)

(b) Using your result from part (a), sketch the graph $y = x^2 - 6x + 10$, showing all significant features. (3 marks)

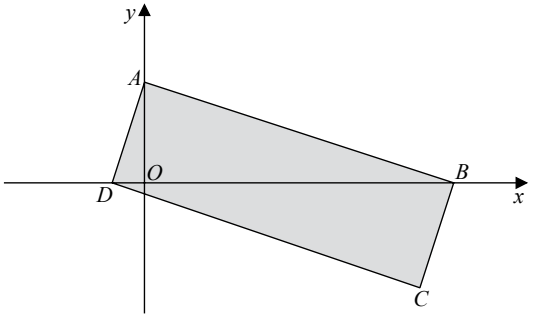


(c) Explain how the graph can be used to show the following statement is always true: (1 mark)

"When a real value of x is substituted into $x^2 - 6x + 10$ the result is positive."

Question 5 **(8 marks)**

The figure below shows a rectangle $ABCD$.



The point A lies on the y-axis and the points B and D lie on the x-axis as shown.

Given that the straight line through the points A and B has equation $5y + 2x = 10$

(a) show that the straight line through the points A and D has equation $2y - 5x = 4$. (3 marks)

(b) determine the coordinates of the points B and D. (2 marks)

(c) determine the coordinates of the midpoint of the diagonal BD. (1 mark)

(d) The diagonals of a rectangle bisect. *Use this fact*, along with your results from part (a) and (c), to determine the coordinates of the point C. (2 marks)

End of Calculator Free Section