



PERTH MODERN SCHOOL

Exceptional schooling. Exceptional students.

INDEPENDENT PUBLIC SCHOOL

Semester One Examination, 2022

Question/Answer booklet

MATHEMATICS METHODS UNIT 1

Section One:

Calculator-free

Your Name _____

Your Teacher's Name _____

Time allowed for this section

Reading time before commencing work: five minutes

Working time: fifty minutes

Materials required/recommended for this section***To be provided by the supervisor***

This Question/Answer booklet

Formula sheet

To be provided by the candidate

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: nil

Important note to candidates

No other items may be taken into the examination room. It is **your** responsibility to ensure that you do not have any unauthorised material. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Question	Marks	Max	Question	Marks	Max
1		6	5		8
2		7	6		5
3		4	7		10
4		7			
			Total		(47)

Structure of this paper

Section	Number of questions available	Number of questions to be answered	Working time (minutes)	Marks available	Percentage of examination
Section One: Calculator-free	7	7	50	47	33
Section Two: Calculator-assumed	12	12	100	94	67
Total					100

Instructions to candidates

1. The rules for the conduct of the Western Australian Certificate of Education ATAR course examinations are detailed in the *Year 12 Information Handbook 2020*. Sitting this examination implies that you agree to abide by these rules.
2. Write your answers in this Question/Answer booklet.
3. You must be careful to confine your answers to the specific questions asked and to follow any instructions that are specific to a particular question.
4. Additional pages for the use of planning your answer to a question or continuing your answer to a question have been provided at the end of this Question/Answer booklet. If you use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number.
5. **Show all your working clearly.** Your working should be in sufficient detail to allow your answers to be checked readily and for marks to be awarded for reasoning. Incorrect answers given without supporting reasoning cannot be allocated any marks. For any question or part question worth more than two marks, valid working or justification is required to receive full marks. If you repeat any question, ensure that you cancel the answer you do not wish to have marked.
6. It is recommended that you **do not use pencil**, except in diagrams.
7. The Formula sheet is **not** to be handed in with your Question/Answer booklet.

Section One: Calculator-free**33% (47 Marks)**

This section has **seven** questions. Answer **all** questions. Write your answers in the spaces provided.

Working time: 50 minutes.

Question 1**(2,2,2 = 6 marks)**

Solve each of the following equations.

(a) $\frac{x}{2} + \frac{2x}{3} = \frac{x+1}{2}$. (2 marks)

(b) $3x^3 = 12x^2$. (2 marks)

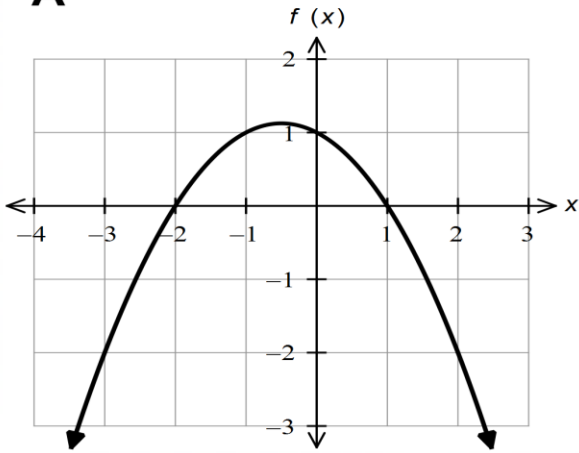
(c) $(x+5)^2 - 49 = 0$. (2 marks)

Question 2

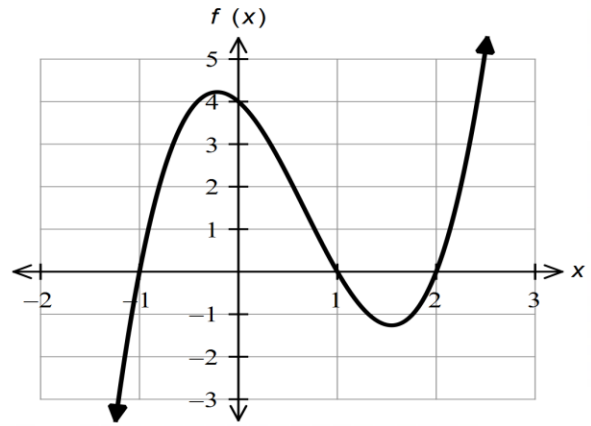
(7 marks)

Consider the graphs drawn below.

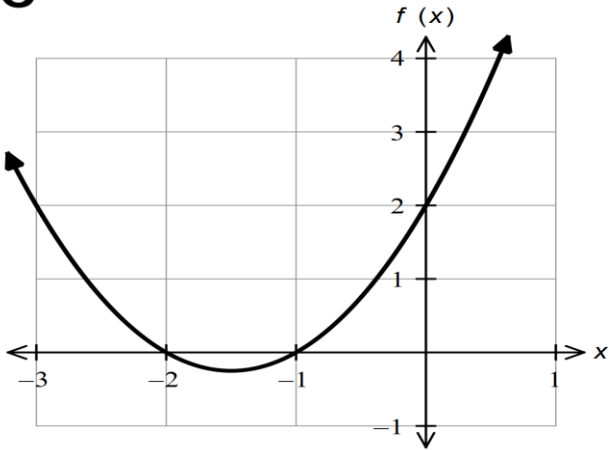
A



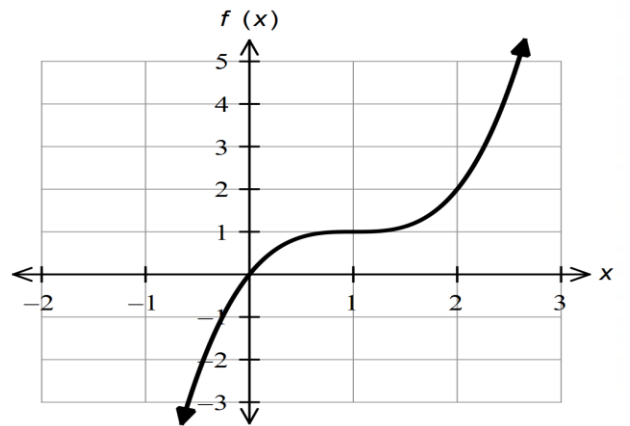
B



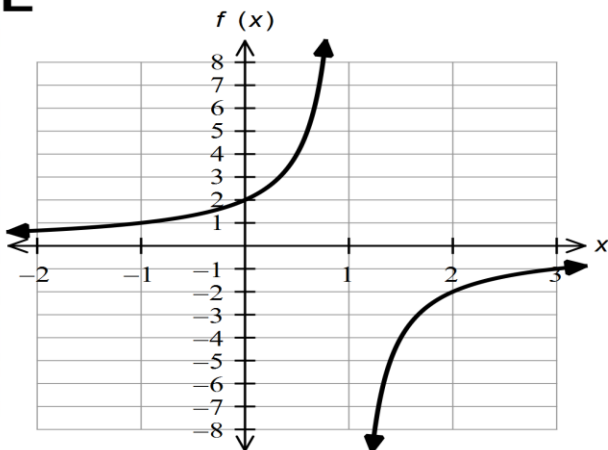
C



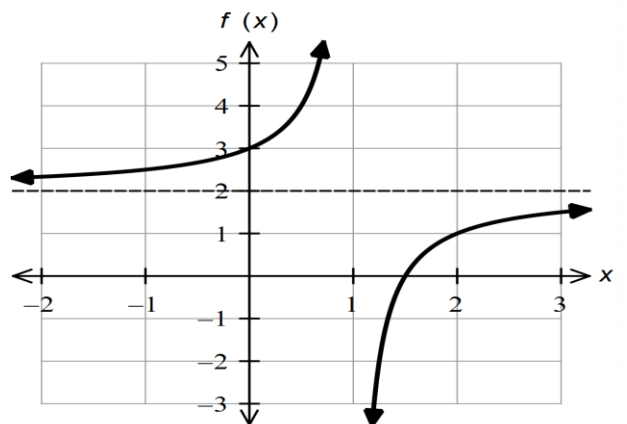
D



E



F



The equations of the graphs drawn are given below.

$$\begin{aligned} f(x) &= a(x-1)(x+2); & f(x) &= \frac{b}{x-1}; & f(x) &= (x-1)^3 + c \\ f(x) &= x^2 + dx + 2; & f(x) &= e(x^2 - 1)(x+f); & f(x) &= \frac{1}{x-1} + g \end{aligned}$$

Determine the values of a , b , c , d , e , f and g .

(7 marks)

Question 3

(4 marks)

A cubic polynomial exists such that $f(1) = 0$, $f(3) = 0$, $f(4) = 6$ and the coefficient of x^3 is 1.

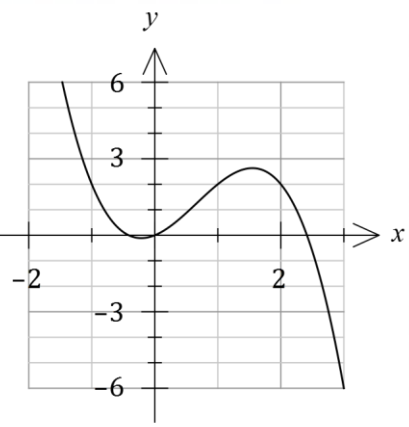
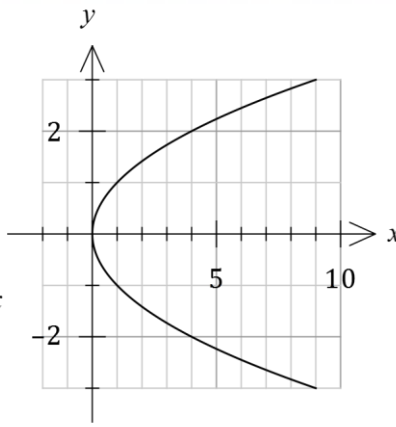
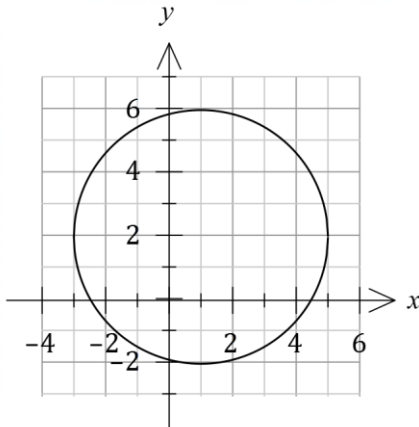
State the polynomial in factorised form.

(4 marks)

Question 4

(1,1,1,1,3 = 7 marks)

The graphs of the function $y = f(x)$ and two relations are shown below.



- (a) Explain how the vertical line test can be used to distinguish a function from a relation. (1 marks)

- (b) State the equation of the parabolic relationship. (1 mark)

- (c) Determine $f(3)$. (1 mark)

- (d) Solve $f(x) = 2$. (1 mark)

- (e) The equation of the circle is $x^2 + y^2 + ax + by = c$, where a, b and c are constants. Determine the value of each constant. (3 marks)

Question 5**(3,2,3 = 8 marks)**

A ball is launched into the air from a roof at a height of 5 metres, such that the height above the ground, t seconds after launch is given by $h(t) = -\frac{t}{3}(t+a) + b$.

After 2 seconds the ball is at a height of 9 metres.

(a) Determine a and b . (3 marks)

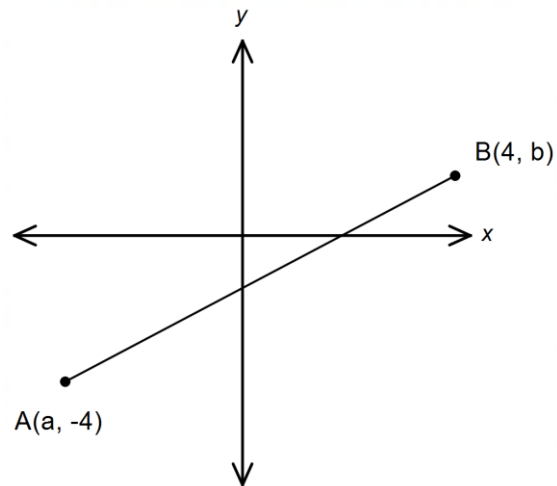
(b) Calculate when the maximum height is reached. (2 marks)

At the same time, an arrow is fired from ground level and its height above ground level is given by $h(t) = 2t$. The arrow hits the ball.

(c) Determine the time the ball is struck. (3 marks)

Question 6

(2,3 = 5 marks)



(a) Determine the equation of the line:

(i) where $a = -2$ and $b = 2$.

(2 marks)

(ii) passing through the mid-point of \overline{AB} and which is perpendicular to \overleftrightarrow{AB} ,
when $a = -4$ and $b = 3$.

(3 marks)

Question 7**(2,2,3,3 = 10 marks)**

The events A and B have the probabilities: $P(A) = a$, $P(B) = b$ and $P(\bar{A} \cap \bar{B}) = 0.32$

(a) Determine an expression for $P(A \cap B)$ in terms of a and b . (2 marks)

If $P(A|B) = 0.2$

(b) Determine an expression for a in terms of b . (2 marks)

(c) Hence, or otherwise determine the values of a and b under each of the following conditions:

(i) $P(\overline{A \cap B}) = 0.97$ (3 marks)

(ii) The events A and B are independent (3 marks)

End of Questions

Supplementary page

Question number: _____

DO NOT WRITE IN THIS AREA AS IT WILL BE CUT OFF

