

Insert School Logo

**Semester Two
Examination 2020
Question/Answer booklet**

**MATHEMATICS
METHODS UNIT 1 and 2**

**Section One:
Calculator-free**

Student Name: _____

Teacher's Name: _____

Time allowed for this section

Reading time before commencing work: five minutes
Working time for paper: fifty minutes

Material 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 tape/fluid, erasers, 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 notes or other items of a non-personal nature in the examination room. If you have any unauthorised material with you, hand it to the supervisor **before** reading any further.

Structure of this paper

	Number of questions available	Number of questions to be attempted	Working time (minutes)	Marks available	Percentage of exam
Section One Calculator—free	7	7	50	50	35
Section Two Calculator—assumed	13	13	100	100	65
				150	100

Instructions to candidates

1. The rules for the conduct of Western Australian external examinations are detailed in the *Year 12 Information Handbook 2020*. Sitting this examination implies that you agree to abide by these rules.
2. Answer the questions according to the following instructions.

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 an answer to any question, ensure that you cancel the answer you do not wish to have marked.

It is recommended that you **do not use pencil**, except in diagrams.

3. You must be careful to confine your responses to the specific questions asked and to follow any instructions that are specific to a particular question.
4. Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.
 - Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
 - Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question that you are continuing to answer at the top of the page.
5. The Formula Sheet is **not** handed in with your Question/Answer Booklet.

Section One: Calculator–free**35% (50 marks)**

This section has **seven (7)** questions. Attempt **all** questions. Write your answers in the spaces provided.

Spare pages are included at the end of this booklet. They can be used for planning your responses and/or as additional space if required to continue an answer.

- Planning: If you use the spare pages for planning, indicate this clearly at the top of the page.
- Continuing an answer: If you need to use the space to continue an answer, indicate in the original answer space where the answer is continued, i.e. give the page number. Fill in the number of the question(s) that you are continuing to answer at the top of the page.

Working time: 50 minutes

Question 1 (8 marks)

A function $f(x)$ is given such that $f(x) = (x + 3)(x^2 - 9)$.

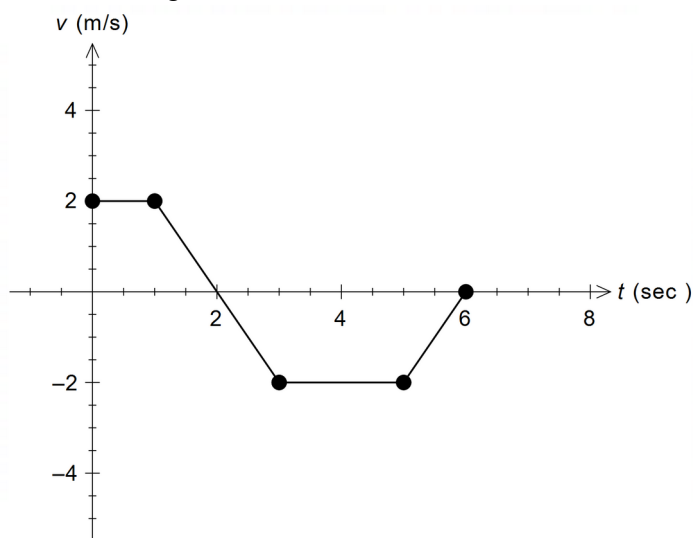
(a) Find all the solutions of $f(x) = 0$. (2 marks)

(b) Use Calculus methods to find the coordinates of the turning points, and state their nature. (5 marks)

(c) State the equation of the function $g(x)$ given that $g(x)$ is equivalent to the function $f(x)$ translated one unit to the left. (Do not simplify.) (1 mark)

Question 2 (5 marks)

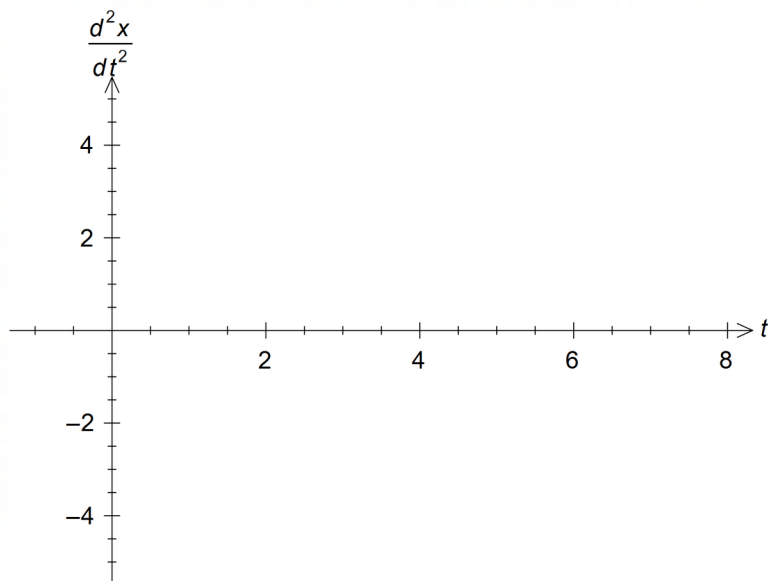
The graph below shows the velocity (m/s), $\frac{dx}{dt}$, as a function of time. Initially the particle is at the origin.



(a) When is the rate of change of the displacement of the particle constant? (2 marks)

(b) At what time is the displacement, x , from the origin a maximum? (1 mark)

(c) On the axes below draw a sketch of the acceleration, $\frac{d^2x}{dt^2}$, for $0 \leq t \leq 6$. (2 marks)



Question 3 (8 marks)(a) Solve for x

(i) $10^x \times 10^5 = 100^4$ (1 mark)

(ii) $2^{x^2 + 3} = 16$ (2 marks)

(b) The product $4 \times 48 \times 81$ is divisible by 6^k .
Determine the largest possible integer value of k . (3 marks)

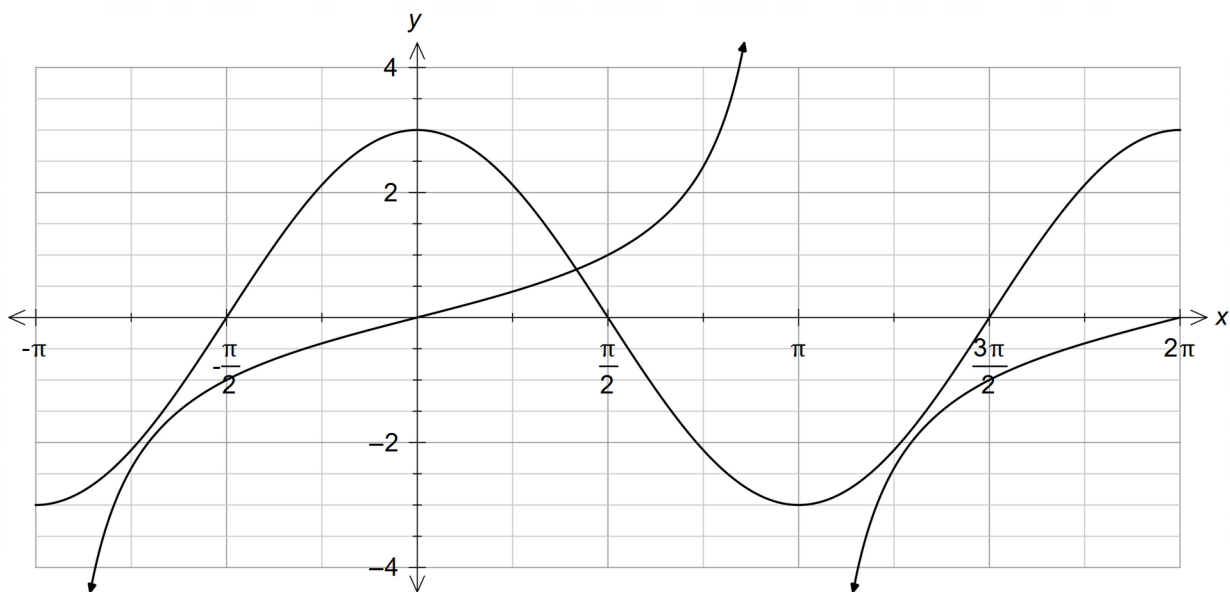
(c) Simplify leaving your solution in scientific notation:

$$\frac{(3.3 \times 10^{-4}) \times (2 \times 10^4)}{1.1 \times 10^{-3}}$$

(2 marks)

Question 4 (6 marks)

Consider the graphs of the functions $y = 3\cos x$ and $y = \tan \frac{1}{2}x$ for $[-\pi, 2\pi]$ below.



- (a) State the period of the function $y = \tan \frac{1}{2}x$. (1 mark)
- (b) State the co-ordinates of the turning point(s) of $y = 3\cos x$. (2 marks)
- (c) State the equation of an asymptote. (1 mark)
- (d) For which values of x do both functions increase, as x increases? (2 marks)

Question 5 (4 marks)

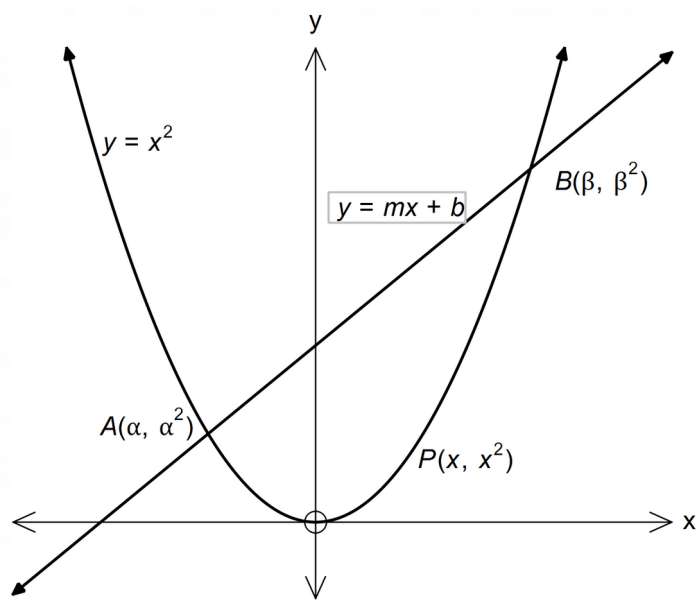
The numbers $4x$, $2x - 3$, $4x - 3$ are three consecutive terms in an arithmetic sequence.

(a) What is the value of x ? (2 marks)

(b) State the recursive definition for this sequence. (2 marks)

Question 6 (9 marks)

The parabola $y = x^2$ intersects with the line AB at the points $A(\alpha, \alpha^2)$ and $B(\beta, \beta^2)$ as shown in the diagram.



- (a) Show clearly that $\alpha + \beta = m$ and $\alpha\beta = -b$. (4 marks)

(Question 6 continued)

- (b) Given that $\alpha = -2$ and $\beta = 4$ find
(i) the equation of the line AB.

(1 mark)

- (ii) The length of the line segment from A to B.

(2 marks)

- (iii) P is a point on the parabola such that the midpoint of the line segment AP is $(-0.25, 3.125)$. Determine the co-ordinates of the point P.

(2 marks)

Question 7 (10 marks)

- (a) Complete the following contingency table. (2 marks)

	Location A	Location B	Totals
Buses left late	15		55
Buses left on time		20	
Totals	40		100

Refer to the above table.

- (b) (i) Identify the events. (1 mark)

- (ii) Determine whether these events are dependent or independent. (3 marks)

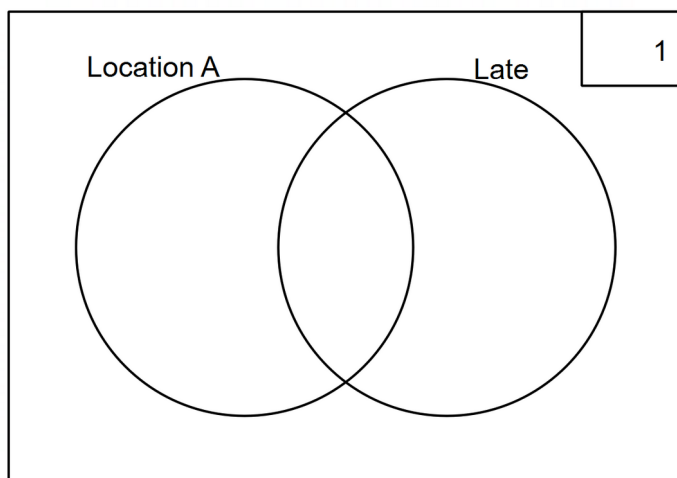
- (iii) If the bus leaves location A, determine the probability that it is on time. (1 mark)

(Question 7 continued.)

Refer to the table and information on the previous page.

- (c) (i) Complete the Venn Diagram below.

(2 marks)



- (ii) Shade in the region on the Venn diagram to show that the bus left from Location B and is on time.

(1 mark)

End of Questions

See next page

Additional working space

Question number(s):