HALE SCHOOL

Semester Two Examination, 2018

Question/Answer booklet

Circle your teacher's initials

IFB MPC AGC MS VMU SWA

MATHEMATICS METHODS UNITS 1 AND 2

Section One
Booklet 1 of 3
(Calculator-free)

Your name _____

59

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 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

Section	Number of questions available	Number of questions to be answered	Working time (minutes)	Marks available	Percentage of examination
Section One: Calculator-free	**9**	**9**	**50**	**59**	**35**
Section Two: Calculator-assumed	12	12	100	88	65
				Total	100

Instructions to candidates

1. The rules for the conduct of examinations are detailed in the school handbook. 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 response to the specific question asked and to follow any instructions that are specified to a particular question.

4. Supplementary pages for the use of planning/continuing your answer to a question have been provided at the end of this Question/Answer booklet. If you use these pages to continue an answer, indicate at the original answer 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.

See next page

Question 1 **(6 marks)**

(a) Evaluate $\frac{a^3}{b^{0.5}}$ when $a = 2 \times 10^2$ and $b = 4 \times 10^4$, writing your answer without the use of scientific notation. (3 marks)

(b) Determine the value of x when $49^x = 7\sqrt{7}$. (3 marks)

Question 2 **(5 marks)**

(a) Expand $(x + 1)^4$. (2 marks)

(b) Hence determine the gradient of the curve $y = (x + 1)^4$ at the point $(-2, 1)$. (3 marks)

See next page

Question 3 **(9 marks)**

(a) Simplify:

(i) $\frac{d}{dx}(\sqrt[3]{x} - \frac{1}{x^2})$ (2 marks)

(ii) $\lim_{h \to 0} \frac{(x+h)^4 - x^4}{h}$ (1 mark)

(b) Determine the equation of the tangent to the curve $y = x^3 - 4x + 3$ when $x = -2$. (4 marks)

(c) Determine $f(x)$ given $f'(x) = 4x - 5$ and $f(2) = -3$. (2 marks)

Question 4 **(8 marks)**

Solve each equation below for x:

(a) $\dfrac{3x}{x-5} = \dfrac{2}{3}$ (2 marks)

(b) $(x+3)(x-3) = 8x$ (3 marks)

(c) $\sqrt{2}\sin x + 1 = 0,\ 0° \leq x \leq 360°$ (3 marks)

See next page

Question 5 **(4 marks)**

A cubic is given by $f(x) = x^3 - x^2 - 24x - 36$.

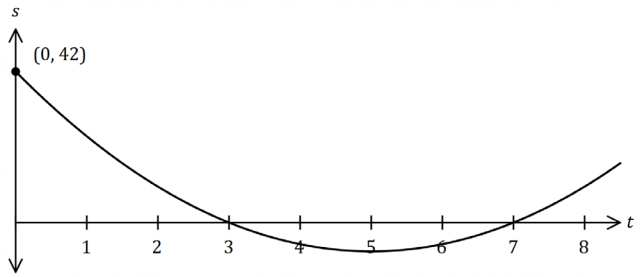
(a) Show that the cubic has a root when $x = -2$. (1 mark)

(b) Determine the coordinates of the other two roots of the cubic. (3 marks)

Question 6 **(6 marks)**

A small body moves in a straight line so that its displacement s metres from a fixed point O after t seconds is given by $s = at^2 + bt + c$.

The position-time graph of the body is shown below.



(a) Determine the values of the constants a, b and c. (3 marks)

(b) Determine the displacement of the body when its velocity is 12 ms^{-1}. (3 marks)

Question 7 **(7 marks)**

The first three terms, in order, of a sequence are $x + 4, x$ and $2x - 15$.

Determine the value of the fourth term of the sequence if:

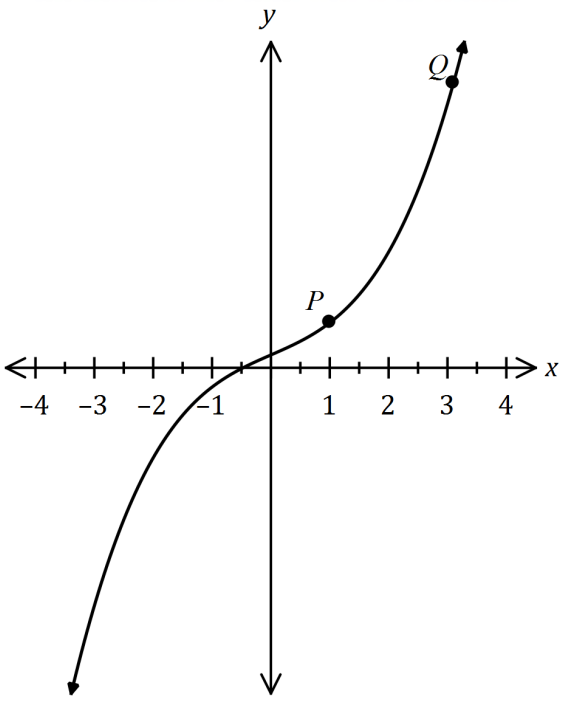
(a) the sequence is arithmetic (3 marks)

(b) the sequence is geometric (4 marks)

See next page

Question 8 **(7 marks)**

Let $f(x) = x^3 + 4x + 2$. The graph of $y = f(x)$ is shown below.



(a) Points P and Q lie on the curve with x-coordinates 1 and 3 respectively.

(i) Determine $f(1)$ and $f(3)$. (1 mark)

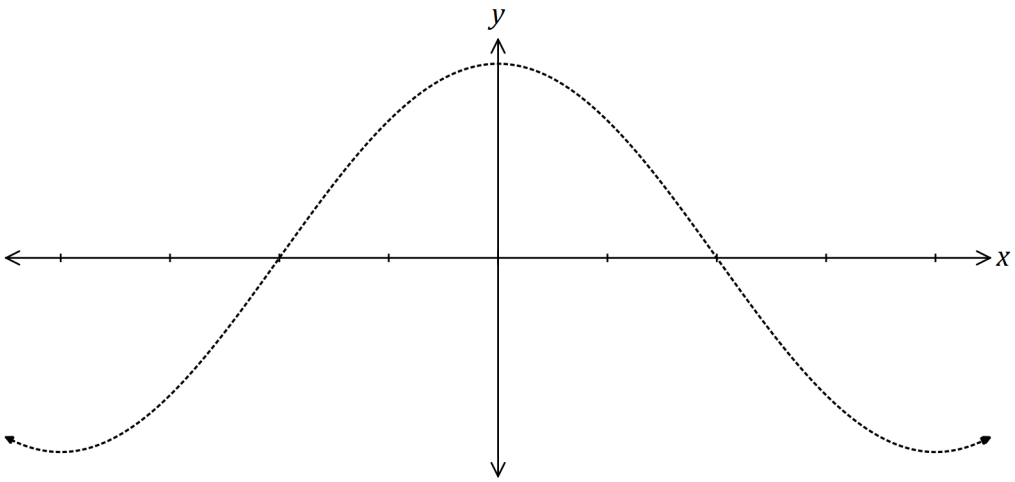
(ii) Determine the gradient of a straight line through P and Q. (2 marks)

(b) Find $f'(x)$ using the calculus method of first principles. (4 marks)

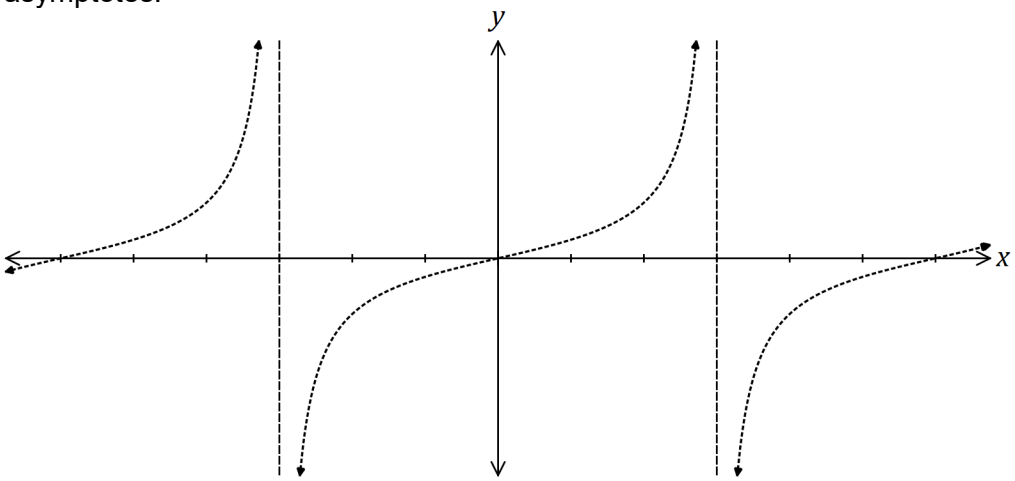
See next page

Question 9 **(7 marks)**

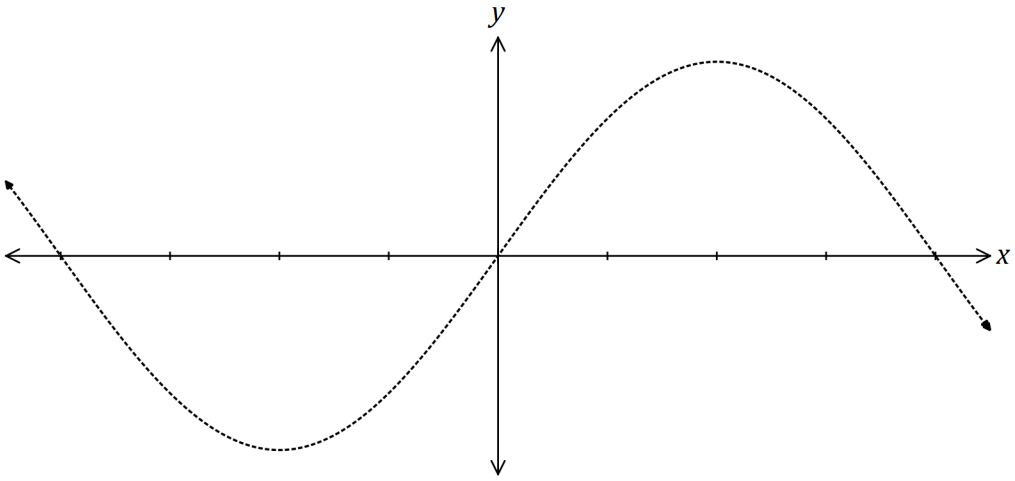
(a) The graph of $y = \cos x$ is shown below. On the same axes, sketch $y = \cos\left(\frac{1}{2}x\right)$. (2 marks)



(b) The graph of $y = \tan x$ is shown below. On the same axes, sketch $y = \tan\left(x - \frac{\pi}{6}\right)$ and all its asymptotes. (3 marks)



(c) The graph of $y = 2\sin x$ is shown below. On the same axes, sketch $y = \cos\left(x - \frac{\pi}{2}\right)$. (2 marks)



End of Section 1

Supplementary page

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