Christ Church Grammar School

Mathematics Department
Year 11 Mathematics Methods

Semester Two Examination, 2018

Question/Answer booklet

MATHEMATICS METHODS UNITS 1 AND 2

Section One: Calculator-free

Fix student label here

Student Name _____

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.

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	8	8	50	52	35
Section Two: Calculator-assumed	14	14	100	98	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, preferably using a blue/black pen. Do not use erasable or gel pens.

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

Section One: Calculator-free **35% (52 Marks)**

This section has **eight (8)** questions. Answer **all** questions. Write your answers in the spaces provided.

Working time: 50 minutes.

Question 1 **(7 marks)**

Solve each equation below for x.

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

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

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

See next page

Question 2 **(3 marks)**

Expand $(2x^2 - \frac{1}{x})^4$, giving your answer in simplified form.

See next page

Additional working space

Question number: _____

Additional working space

Question number: _____

Question 3 **(6 marks)**

(a) Evaluate $\frac{m^{0.5}}{n^2}$ when $m = 4 \times 10^6$ and $n = 5 \times 10^2$, writing your answer without the use of scientific notation. (3 marks)

(b) Determine the value of x when $4^x = 32\sqrt{2}$. (3 marks)

See next page

Question 4 **(7 marks)**

(a)

(i) Calculate $\frac{d}{dx}(3x^4 - 2x + 12)$. (1 mark)

(ii) Simplify $\lim_{h \to 0} \frac{(x+h)^3 - x^3}{h}$. (1 mark)

(b) Determine the equation of the tangent to the curve $y = x^3 + 2x + 5$ when $x = -1$. (3 marks)

(c) Determine $f(x)$ given $f'(x) = 8x + 3$ and $f(-2) = 5$. (2 marks)

See next page

Question 8 continued

(b)

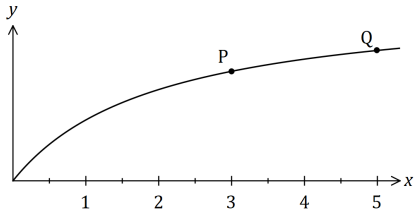
(i) Use the formula $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$ to determine $\frac{dy}{dx}$ for the curve. (4 marks)

(ii) Calculate the gradient of the curve at $\boldsymbol{P}$. (1 mark)

End of questions

Question 8 **(8 marks)**

Let $f(x) = \frac{x}{x+2}$. The graph of $y = f(x)$ is shown below.



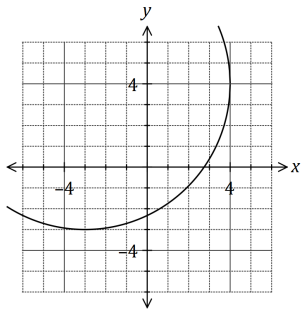
(a) Points P and Q lie on the curve with x-coordinates 3 and 5 respectively.

(i) Determine $f(3)$ and $f(5)$. (1 mark)

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

Question 5 **(7 marks)**

(a) Part of the circle $x^2 + y^2 = ax + by + c$ is shown below. Determine the values of the constants a, b and c. (3 marks)



(b) Solve the following quadratic equation by **completing the square**. Give your answer in exact form. (4 marks)

$$2x^2 + 6x - 16 = 0.$$

Question 6 **(6 marks)**

The derivative of a cubic polynomial is given by $\frac{dy}{dx} = 3x^2 - 2x - 24$.

The cubic passes through the point $(-1, -14)$.

(a) Determine the equation of the cubic. (2 marks)

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

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

See next page

Question 7 **(8 marks)**

The first three terms, in order, of a sequence are $4x - 1, 2x - 5$ and $x - 4$.

Determine the fourth term of the sequence if

(a) the sequence is arithmetic. (4 marks)

(b) the sequence is geometric. (4 marks)

See next page