



**Semester 1 Examination, 2020**

**Question/Answer Booklet**

**MATHEMATICS METHODS**

**UNIT 1**

**Section One:  
Calculator Free**

Fix student label here

Student 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.

## 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	53	35
Section Two: Calculator-assumed	14	14	100	97	65
<b>Total</b>					100

## Instructions to candidates

1. The rules for the conduct of examinations are detailed in the Christ Church Grammar School reporting and assessment policy. 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 answer to the specific question asked and to follow any instructions that are specified to a particular question.
4. 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.
5. It is recommended that you do not use pencil, except in diagrams.
6. Supplementary pages for planning/continuing your answers to questions are 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.
7. The Formula sheet is not to be handed in with your Question/Answer booklet.

**Section One: Calculator-free****35% (53 Marks)**

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

Supplementary pages for planning/continuing your answers to questions are 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.

Working time: 50 minutes.

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**Question 1****(5 marks)**

The point  $M(-2, 5)$  is the midpoint of point  $A(-6, 3)$  and point  $B$ .

(a) Determine the coordinates of point  $B$ . (2 marks)

(b) Determine the equation of the straight line that passes through point  $C(4, -1)$  and is perpendicular to the line through points  $A$  and  $M$ . (3 marks)

**Question 2****(5 marks)**

Functions  $f$  and  $g$  are defined by  $f(x) = 4x^2 - 4x + 5$  and  $g(x) = 2x^2 - 8x + 6$ .

(a) Determine the discriminant of  $f$  and the discriminant of  $g$ . (2 marks)

(b) State, with justification, which function has no zeros and determine all zeros of the other function. (3 marks)

**Question 3****(4 marks)**The expansion of  $(x + 1)^9$  is

$$x^9 + 9x^8 + 36x^7 + 84x^6 + 126x^5 + 126x^4 + 84x^3 + 36x^2 + 9x + 1.$$

- (a) Determine the number of combinations of 6 objects taken from a set of 9 distinct objects. (1 mark)

- (b) Consider the simplified expansion of  $(x + 1)^{10}$ . The first four terms in descending powers of  $x$  are

$$x^{10} + ax^9 + bx^8 + cx^7.$$

- (i) State the number of terms in the complete simplified expansion. (1 mark)

- (ii) Determine the value of each of the coefficients  $a, b$  and  $c$ . (2 marks)

## Question 4

(8 marks)

(a) A periodic function is defined by  $f(x) = 2 - 2 \sin(3x)$ .

(i) State the amplitude of the function.

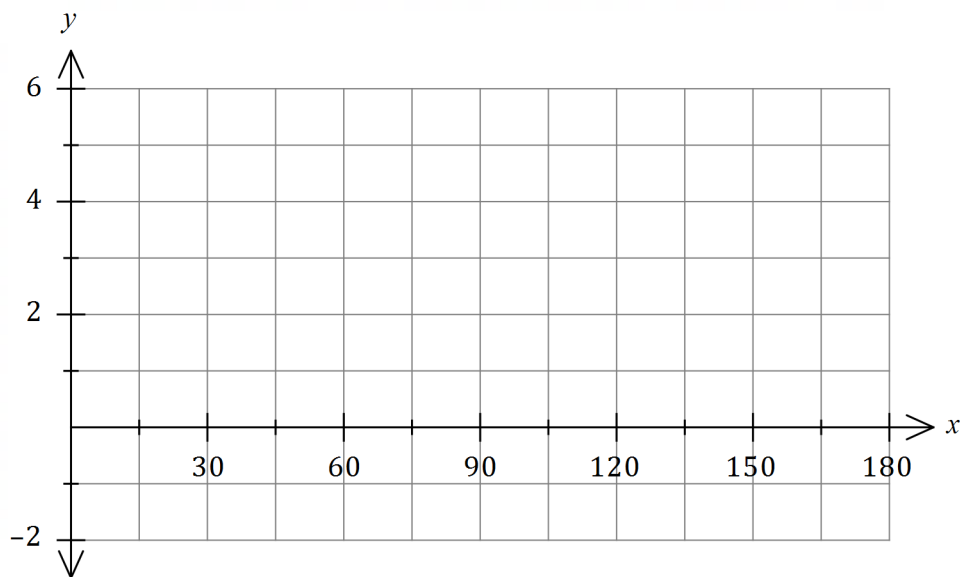
(1 mark)

(ii) State the period of the function in degrees.

(1 mark)

(iii) Sketch the graph of  $y = f(x)$  on the axes below.

(3 marks)



(b) Solve the equation  $2 \cos(x - 15^\circ) = \sqrt{3}$  where  $0 \leq x \leq 360^\circ$ .

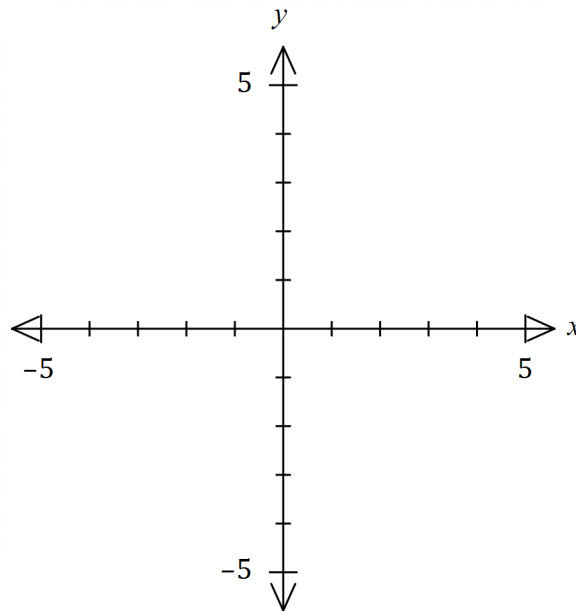
(3 marks)

**Question 5**

**(7 marks)**

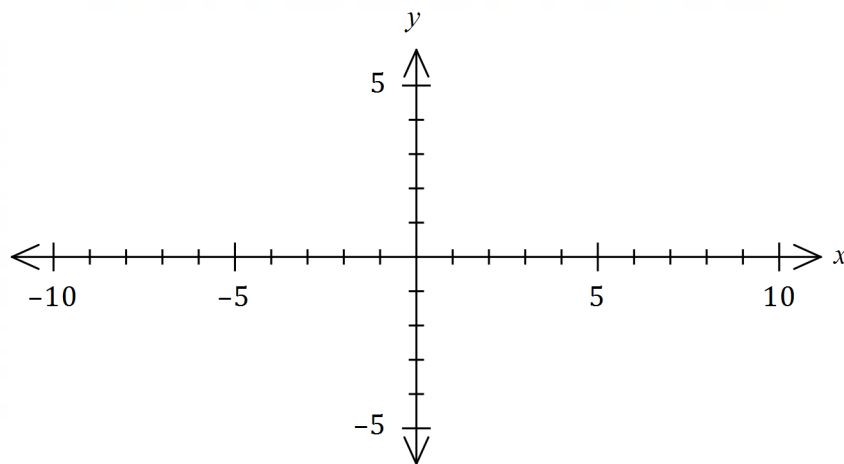
(a) Sketch the graph of  $(x - 1)^2 + (y + 1)^2 = 4$  on the axes below.

**(3 marks)**



(b) Sketch the graph of  $y^2 = x$  on the axes below.

**(2 marks)**



(c) Explain whether  $y$  is a function of  $x$  in the relationship graphed in (b).

**(2 marks)**

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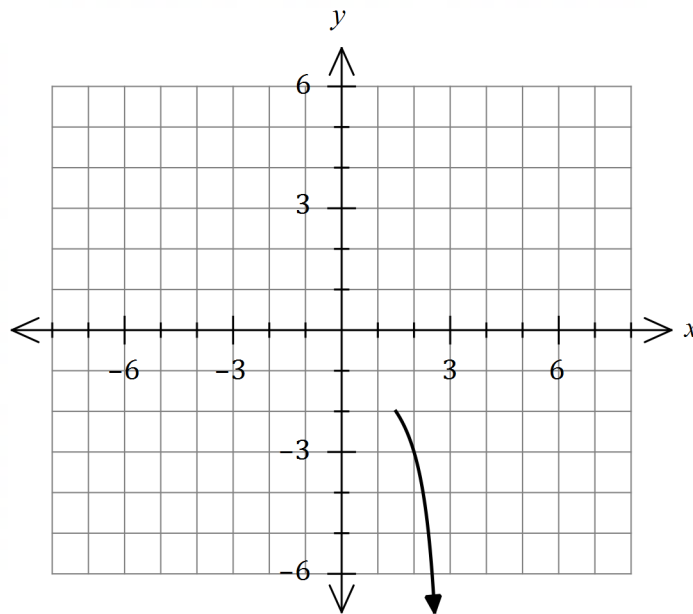
**Question 6****(8 marks)**

(a) The variable  $P$  is inversely proportional to the variable  $t$ , so that when  $t = 2.4$ ,  $P = 20$ .

(i) Explain how  $P$  will change as  $t$  decreases. (1 mark)

(ii) Determine  $t$  when  $P = 6$ . (2 marks)

(b) Part of the graph of  $y = \frac{a}{x-3}$  is drawn below.



(i) Determine the value of  $a$ . (2 marks)

(ii) Draw the remainder of the graph. (3 marks)



**Question 7****(8 marks)**

(a) Determine an exact value for  $\sin 80^\circ \cos 110^\circ - \cos 80^\circ \sin 110^\circ$ . (2 marks)

(b) Determine all possible values of  $\tan \theta$  when  $\cos \theta = \frac{2}{5}$ . (3 marks)

(c) Determine an exact value for  $\cos 105^\circ$ . (3 marks)

**Question 8****(8 marks)**Solve the following equations for  $x$ .

(a)  $x^2 + 20x - 21 = 0.$

**(2 marks)**

(b)  $(x - 1)^2 - 4 = 2x - 3.$

**(3 marks)**

(c)  $x^3 - 2x^2 - 11x + 12 = 0.$

**(3 marks)**

Supplementary page

Question number: \_\_\_\_\_

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