



CORPUS CHRISTI COLLEGE

SEQUERE DOMINUM

Semester One Examination, 2022

Question/Answer booklet

# MATHEMATICS METHODS UNIT 1

## Section One: Calculator-free

If required by your examination administrator, please place your student identification label in this box

WA student number: In figures

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In words

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Your name

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### Time allowed for this section

Reading time before commencing work: five minutes

Working time: fifty minutes

Number of additional  
answer booklets used  
(if applicable):

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### 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	7	7	50	52	35
Section Two: Calculator-assumed	12	12	100	98	65
<b>Total</b>					100

## Instructions to candidates

- 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.
- Write your answers in this Question/Answer booklet preferably using a blue/black pen. Do not use erasable or gel pens.
- You must be careful to confine your answers to the specific question asked and to follow any instructions that are specific to a particular question.
- 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.
- It is recommended that you do not use pencil, except in diagrams.
- 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.
- The Formula sheet is not to be handed in with your Question/Answer booklet.

Markers use only		
Question	Maximum	Mark
1	6	
2	6	
3	8	
4	7	
5	6	
6	11	
7	8	
S1 Total	52	
S1 Wt ( $\times 0.6731$ )	35%	
S2 Wt	65%	
Total	100%	

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

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

Working time: 50 minutes.

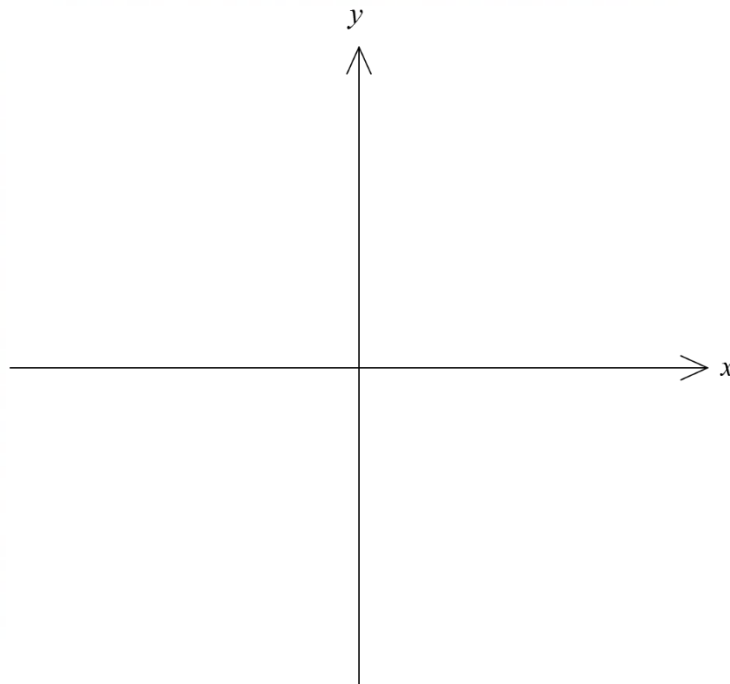
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**Question 1****(6 marks)**

(a) Solve the equation  $x^2 - 6 = x$ .

**(2 marks)**

- (b) Sketch the graphs of  $y = x^2 - 6$  and  $y = x$  on the axis below, showing the coordinates of all axes intercepts of the parabola and any points of intersection of the graphs. **(4 marks)**



**Question 2****(6 marks)**

Solve each of the following equations.

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

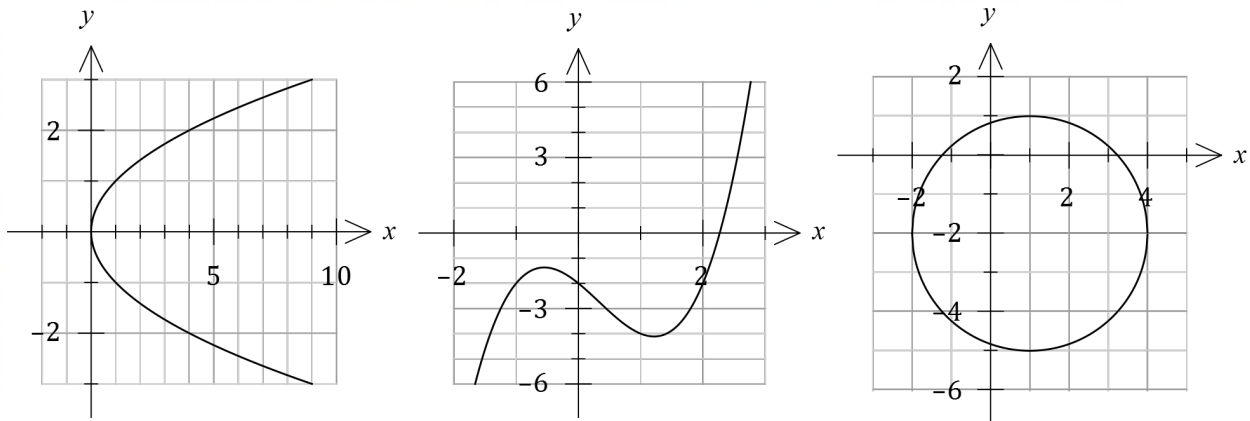
(b)  $3x^3 = 12x^2$ . (2 marks)

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

Question 3

(8 marks)

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



- (i) Explain how the vertical line test can be used to distinguish a function from a relation. (2 marks)
  
- (ii) State the equation of the parabolic relationship. (1 mark)
  
- (iii) Determine  $f(1)$ . (1 mark)
  
- (iv) Solve  $f(x) = -2$ . (1 mark)

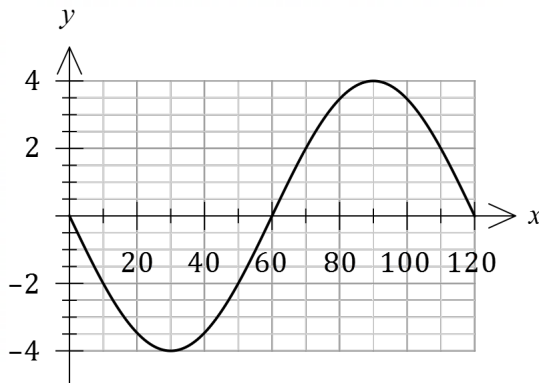
(b) Consider the points  $A(6, -10)$  and  $B(-2, -4)$ . Determine the equation of the line through  $A$  that is perpendicular to  $AB$ . (3 marks)

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## Question 4

(7 marks)

- (a) The graph of  $y = a \sin(bx)$  is shown. State the value of the constant  $a$  and the value of the constant  $b$ . (2 marks)



- (b) Point  $P$  lies on the unit circle with centre  $O$  so that the anticlockwise angle measured from the positive  $x$ -axis to the line  $OP$  is  $\theta$ ,  $0 \leq \theta \leq 2\pi$ . Determine the size of  $\theta$  when  $P$  has coordinates  $\left(-\frac{\sqrt{3}}{2}, \frac{1}{2}\right)$ . (2 marks)

- (c) Solve the equation  $\sqrt{2} \cos(2x + 15^\circ) + 1 = 0$  when  $0 \leq x \leq 180^\circ$ . (3 marks)

**Question 5****(6 marks)**(a) Expand  $(x - 5)(x + 1)(x + 5)$ .

(2 marks)

(b) Let  $f(x) = x^3 - 6x^2 - x + 30$ .(i) Calculate  $f(-2) + f(2)$ .

(1 mark)

(ii) Solve  $f(x) = 0$ .

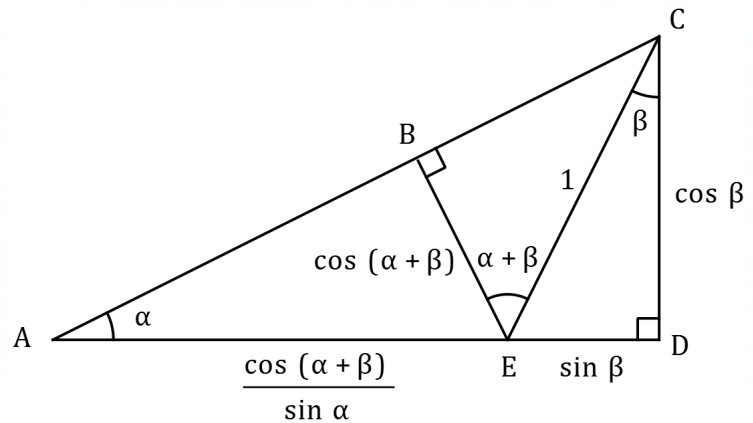
(3 marks)

## Question 6

(11 marks)

In the diagram,  $ADC$  is a right triangle, and points  $B$  and  $E$  lie on sides  $AC$  and  $AD$  respectively to form right triangles  $CBE$  and  $CDE$ .

The length of  $CE$  is 1 unit,  $\angle CAD = \alpha$  and  $\angle DCE = \beta$ , from which it can be shown that  $CD = \cos \beta$ ,  $ED = \sin \beta$  and  $BE = \cos(\alpha + \beta)$ .



- (a) Use triangle  $ABE$  to explain why  $AE = \frac{\cos(\alpha + \beta)}{\sin \alpha}$ . (1 mark)

- (b) Given that  $AD = AC \cos \alpha$  and  $CD = AC \sin \alpha$ , show that

$$\frac{\cos \alpha}{\sin \alpha} = \frac{\frac{\cos(\alpha + \beta)}{\sin \alpha} + \sin \beta}{\cos \beta}.$$

(2 marks)



- (c) Use the equation from part (b) to derive the identity  $\cos(\alpha + \beta) = \cos \alpha \cos \beta - \sin \alpha \sin \beta$ .  
(2 marks)

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

- (e) Solve  $2 \cos\left(x + \frac{3\pi}{4}\right) + \sqrt{2} \sin x = 0$  for  $0 \leq x \leq 2\pi$ . (3 marks)

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

(a) A circle of radius 5 has its centre at (6, -4).

(i) Determine the equation of this circle.

(2 marks)

(ii) State, with justification, whether the point (9, -8) lies on the circle.

(1 mark)

(b) Determine the centre and radius of the circle with equation  $x^2 + y^2 - 4x + 6y + 9 = 0$ .

(3 marks)

(c) Determine the coordinates of the vertex and the equation of the axes of symmetry of the curve with equation  $2y^2 = x + 3$ .

(2 marks)

Supplementary page

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

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