

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.

Special items: nil

To be provided by the candidate
Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

To be provided by the supervisor
Materials required/recommended for this section
Formula sheet
This Question/Answer Booklet

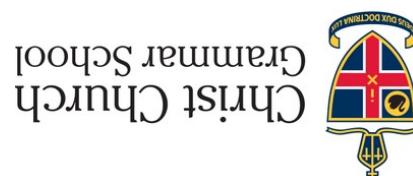
Time and marks available for this section
Working time for this section: 30 minutes
Marks available: 25 marks

Teacher's name _____

Your name _____
Sol Whaas

Section One:
Calculator-free
MATHEMATICS METHODS Year 11

Test 3
2021



Instructions to candidates

1. The rules of conduct of the CCGS assessments are detailed in the Reporting and Assessment Policy. Sitting this assessment implies that you agree to abide by these rules.
2. Write your answers in this Question/Answer Booklet using a blue/black pen. Do not use erasable or gel pens.
3. Answer all questions.
4. 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.
5. 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.
6. **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.
7. It is recommended that **you do not use pencil**, except in diagrams.

- **Dilution** parallel to the **Cl** axis by scale factor $\frac{1}{4}$.
- **Translational** parallel to the **axis** must be correct.
- **Voluminal** herself.

b) List the sequence of transformations needed to transform the function $y = \sqrt{x}$ to $y = \sqrt{4x} + 2$ (2 marks)

- Simplex
- Transposition
- Apples horizontal
- Apples vertical

$$(iii) \quad f(x) = 2x^2 + 3x - 1 \text{ is translated 2 units to the left and 3 units up. (3 marks)}$$

application of differentiation

$$= (\Sigma - \pi c) \frac{\Sigma}{\pi} - = h$$

The function $f(x) = (x - 3)^4$ is reflected in the x -axis followed by a dilation of scale factor $\frac{1}{2}$ parallel to the y -axis. (2 marks)

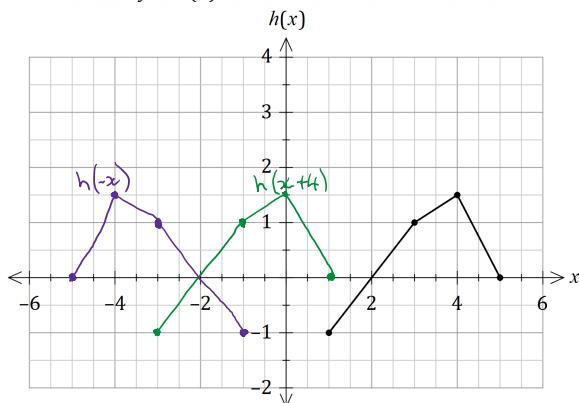
For each of the following determine the new equation once each of the given transformations has been applied.

Question 1

Question 2

(7 marks)

The graph of the function $y = h(x)$ is shown below.



- (a) Sketch the graph of $h(x + 4)$ on the above axis and label the function clearly. (2 marks)

\checkmark All points correct & connected.

- (b) Sketch the graph of $h(-x)$ on the above axis and label the function clearly. (2 marks)

\checkmark All points correct & connected.

- (c) Solve $h(x + 4) = h(-x)$. (1 mark)

$$x = -2 \quad \checkmark \text{Correct } x \text{ value}$$

- (d) State the co-ordinates of the maximum point of $y = -2h(-x)$. (2 marks)

$$(-1, 2) \quad \checkmark \text{Correct } x \text{ value}$$

\checkmark Correct y value
-1 if not a coord.

Additional working space

Question number: _____

-1 if corner is
not a coordinate
point already
marked in Q2d

/ complete the
square.
/ centre is
on axis.
/ radius.

$$Centre = (5, -4)$$

$$\begin{aligned}x^2 + y^2 + 8y &= 40 \\(x-5)^2 - 25 + (y+4)^2 - 16 &= 40 \\x^2 - 10x + y^2 + 8y &= 40\end{aligned}$$

Determine the radius and centre of the circle given by $x^2 + y^2 = 10x - 8y + 40$.

(3 marks)

Question number: _____

Additional working space

Question 4

(4 marks)

Solve the following:

$$5 \cos(x) - 2 \cos^2 x - 2 = 1 \text{ for } -180^\circ \leq x \leq 180^\circ$$

$$5 \cos(x) - 2 - 2 \cos^2(x) = 1$$

✓ simplifies

$$-2 \cos^2(x) + 5 \cos(x) - 3 = 0$$

let $h = \cos(x)$

$$-2h^2 + 5h - 3 = 0$$

$$-(2h-3)(h-1) = 0$$

✓ factorises (can leave cos(x) in)

$$2 \cos x - 3 = 0$$

$$\cos x - 1 = 0$$

$$2 \cos x = 3$$

$$\cos x = \frac{3}{2}$$

$$\therefore 0^\circ$$

$$\cos x = 1$$

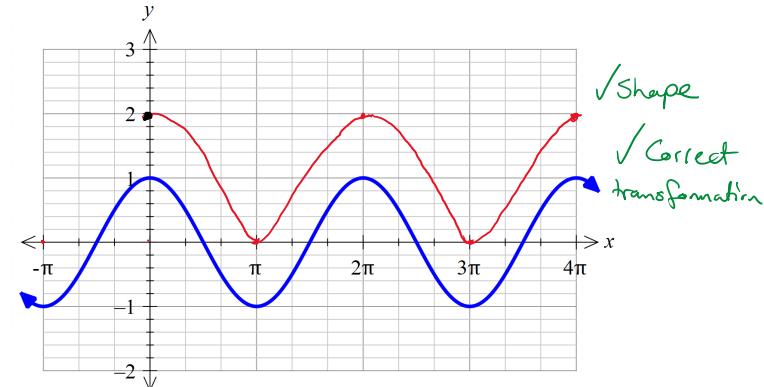
$$x = 0^\circ$$

*// Solves using null factor law.**-1 mark if no units.*

(4 marks)

Question 8

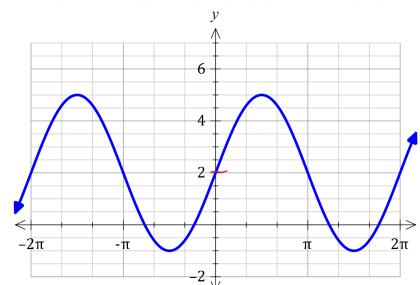
(7 marks)

(a) Consider the graph of $y = \cos(x)$ shown below.(i) Add a sketch for $y = \cos(x) + 1$ for $0 \leq x \leq 4\pi$ (2 marks)(ii) Determine the equation of the new curve in the form $y = a \sin(x - c) + d$. (3 marks)

$$y = -\sin(x - \frac{\pi}{2}) + 1$$

*✓ Reflection
✓ phase shift
✓ translation*

(b) Determine the equation of the following sine function. (2 marks)



*y = 3 sin x + 2
✓ amplitude
✓ translation*

(4 marks)

(4 marks)

Question 5

(2 marks)

(c) Will she touch the water? Explain your answer.

- ✓ Suitable angle
- ✓ Difference
- ✓ Subtended angle
- ✓ Angles in the same segment
- ✓ Substituted into formula
- ✓ Replaced with exact values
- ✓ Simplified

$$\sin(45 - 30) = \sin(45)\cos(30) - \cos(45)\sin(30)$$

Question 5

(d) If the bungee cord is perfectly elastic, after how many seconds will she first return to the level of the bridge? (1 mark)

*✓ Answer has a value
of marks.*

15.7 sec

- ✓ Reasoning
- ✓ Safety gear
- ✓ 1.5m below the water

$$\begin{aligned} \sin(60 - 45) &= \sin(60)\cos(45) - \cos(60)\sin(45) \\ &= \frac{\sqrt{3}}{2} \times \frac{1}{2} - \frac{1}{2} \times \frac{\sqrt{2}}{2} \\ &= \frac{\sqrt{3}}{4} - \frac{\sqrt{2}}{4} \end{aligned}$$

$$\begin{aligned} \overline{OR} &= \sqrt{3-1} \\ &= \sqrt{2} \\ &= \frac{\sqrt{3}}{2} \times \frac{1}{2} - \frac{1}{2} \times \frac{\sqrt{2}}{2} \\ &= \frac{\sqrt{3}}{4} - \frac{\sqrt{2}}{4} \end{aligned}$$

- ✓ Suitable angle
- ✓ Difference
- ✓ Subtended angle
- ✓ Angles in the same segment
- ✓ Substituted into formula
- ✓ Replaced with exact values
- ✓ Simplified

(4 marks)

(2 marks)

(c) Will she touch the water? Explain your answer.

- ✓ Safety gear
- ✓ 1.5m below the water

Additional working space

Question number: _____

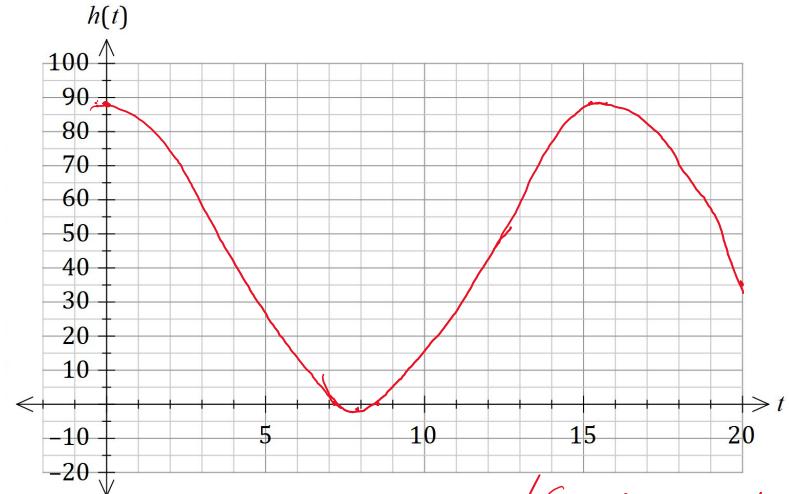
Question 7

(7 marks)

In a moment of foolishness, a student decides to go bungee jumping from a bridge. On the way down, she reflects that her height in metres above the water at any time t seconds after leaping can be described using the function:

$$h(t) = 45 \cos(0.4t) + 43.5$$

- (a) On the axes below, sketch a graph of her height for the first 20 seconds. (3 marks)



✓ Correct max value
 ✓ Correct shape.
 ✓ Minimum correct location

- (b) Determine the time/s when the student is 50 m above the water. (1 mark)

3.56 sec, 12.1 sec

3 19.3 sec

✓ At least
 two correct.

Question 6
 $P = 1125$. Determine the value of h when $P = 7200$. (2 marks)

CALCULATOR-ASSUMED 3 MATHEMATICS METHODS Year 11

CALCULATOR-FREE 9 MATHEMATICS METHODS Year 11

Question 6
 Additional working space (4 marks)

$P = 1125$, is directly proportional to another quantity h and when $h = 4.5$,
 $P = 250$. Determine the value of h when $P = 7200$. (2 marks)

$$P = ah$$

$$1125 = a(4.5)$$

$$a = \frac{1125}{4.5}$$

$$a = 250$$

$$P = 250h$$

$$7200 = 250h$$

$$h = \frac{7200}{250}$$

$$h = 28.8$$

Question 6
 Additional working space (4 marks)

(b) The force of attraction, F , between two magnets varies inversely with the square of the distance, d , between them. When the magnets are 2 cm apart, the force of attraction, F , is 18 newtons. Determine the attractive force between the magnets if the distance between them is 6 cm. (2 marks)

$$F = \frac{k}{d^2}$$

$$18 = \frac{k}{a^2}$$

$$18 = \frac{k}{4}$$

$$k = 72$$

$$\sqrt{72} = \sqrt{\frac{k}{d^2}}$$

$$\sqrt{72} = \sqrt{\frac{72}{36}}$$

$$\sqrt{72} = \sqrt{2}$$

$$= 2 \text{ newtons.}$$

Question number: _____

Additional working space (4 marks)



MATHEMATICS METHODS Year 11

Section Two:
Calculator-assumed

Your name Solutions

Teacher's name _____

Time and marks available for this section

Working time for this section: 15 minutes
Marks available: 18 marks

Materials required/recommended for this section

To be provided by the supervisor

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Formula Sheet (retained from Section One)

To be provided by the candidate

Standard items: pens (blue/black preferred), pencils (including coloured), sharpener, correction fluid/tape, eraser, ruler, highlighters

Special items: drawing instruments, templates, and up to three calculators approved for use in this assessment

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