Christ Church Grammar School

2019
TEST 3

MATHEMATICS METHODS Year 11

Section One:
Calculator-free

Your name _____

Teacher's name _____

Time and marks available for this section

Reading time for this section:	3 minutes
Working time for this section:	30 minutes
Marks available:	30 marks

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.

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.

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.

A water level of 6.0 metres is the critical level for boat safety.

(b) Write the equation (with an appropriate domain) that needs to be solved to determine when, on **28th March 2019**, a water level of 6.0 metres occurs. (2 marks)

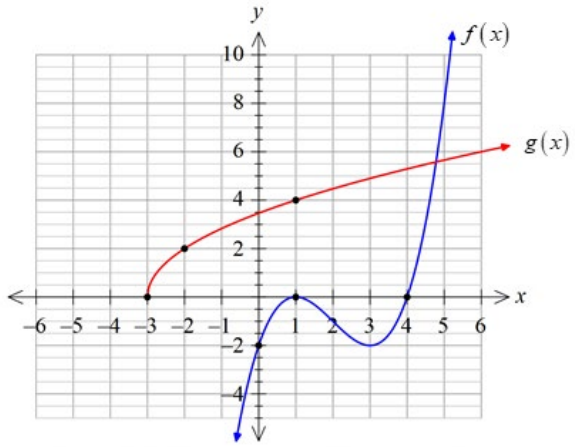
The water level must be greater than 6.0 metres for boat safety. A mathematician wished to make a prediction for when the river will be safe for boats on **28th March 2019**.

(c) Determine when the river will be safe for boats on **28th March 2019**. (2 marks)

End of Questions

Question 1 **(7 marks)**

The graphs of functions $f(x)$ and $g(x)$ are shown below.



Determine the defining rule for function:

(a) $f(x)$ in the form ax^3+bx^2+cx+d. (4 marks)

(b) $g(x)$ (3 marks)

Question 2 **(8 marks)**

Consider the polynomial $P(x) = x^3 - 5x^2 + 2x + 8$.

(a) State the degree of function $P(x)$. (1 mark)

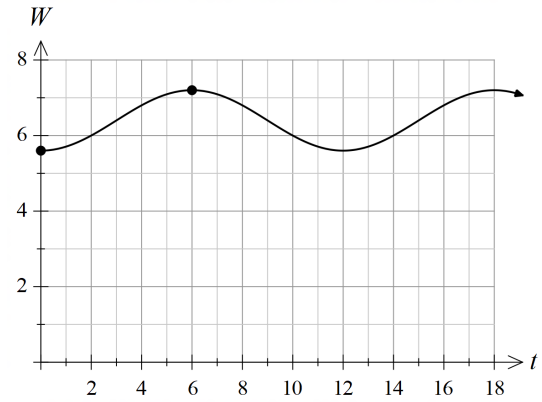
(b) Show that $(x+1)$ is a factor of $P(x)$. (2 marks)

(c) Hence fully factorise $P(x)$. (2 marks)

Question 8 **(8 marks)**

The water level at a fixed point in a river varies with the rise and fall of the tide, as shown in the diagram below. At 2:00 pm one afternoon on 26th March 2019, it is noticed that the water level is 5.6 metres at low tide. At 8:00 pm, the next time for high tide, the water level is 7.2 metres.

Let $t =$ the time in hours elapsed after 2:00 pm on 26th March 2019.
$W(t) =$ the water level measured in metres.



(a) If the water level is modelled by the function $W(t) = a\cos(bt) + c$ detemine the values of the constants a, b and c. (4 marks)

See next page

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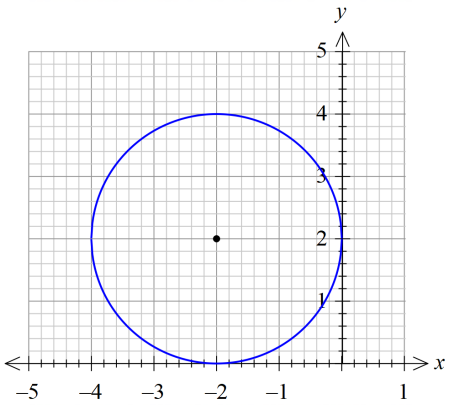
See next page

(d) Solve the equation $P(x) = -x^2 - x + 8$. (3 marks)

Question 3 **(2 marks)**

The graph of a circle is shown below. Determine the equation for this circle.



Christ Church Grammar School

2019
TEST 3

MATHEMATICS METHODS Year 11

Section Two:
Calculator-assumed

Your name _____

Teacher's name _____

Time and marks available for this section

Working time for this section:	10 minutes
Marks available:	8 marks

Materials required/recommended for this section

To be provided by the supervisor

This Question/Answer Booklet
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

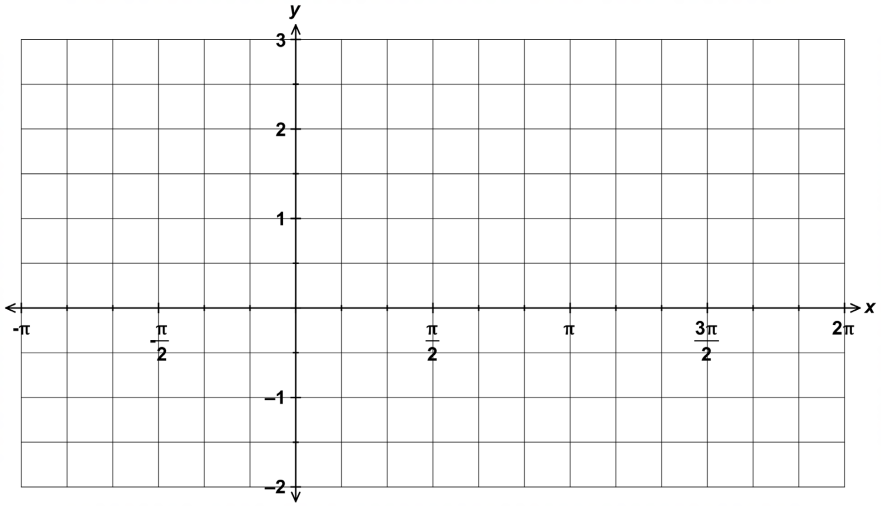
Special items: drawing instruments, templates, notes on one unfolded sheet of A4 paper and up to three calculators approved for use in the WACE examinations

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.

Question 7 **(4 marks)**

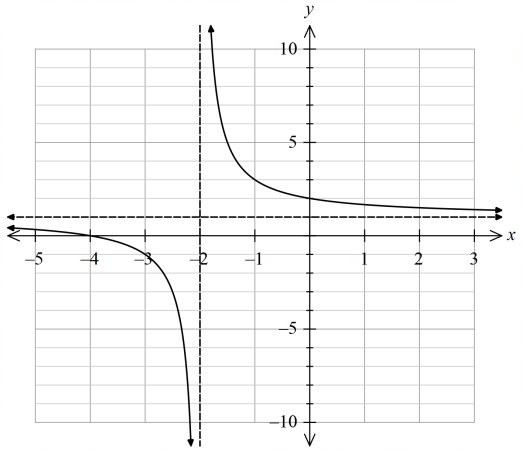
On the axes below, sketch the graph of $g(x) = 2\sin\left(x - \frac{\pi}{6}\right) + 1$ for $-\pi \le x \le 2\pi$



End of Questions

Question 4 **(3 marks)**

The diagram shows the graph of function $f(x) = \frac{2}{x+2} + 1$



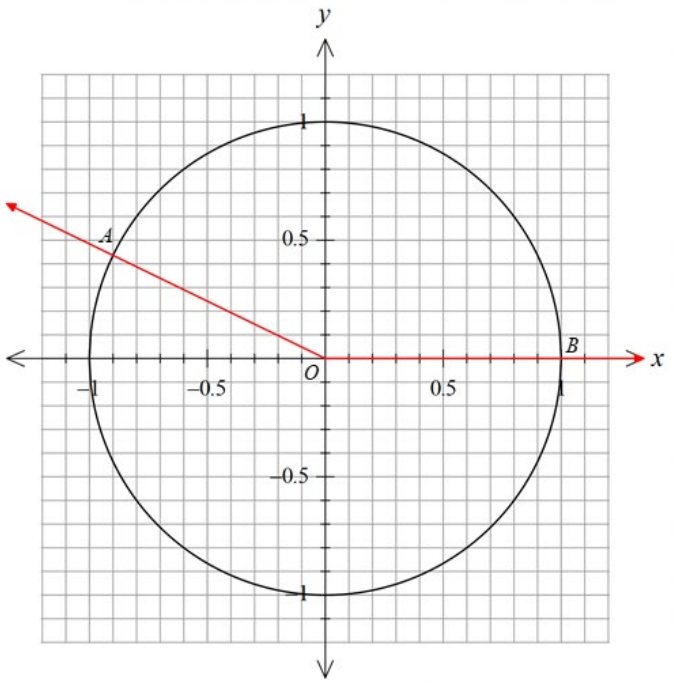
In each question, write the specific defining rule if the following transformations are applied to $f(x) = \frac{2}{x+2} + 1$.

(a) Reflect about the *y*-axis. (1 mark)

(b) Translate 1 unit down, then dilate vertically about the *y*-axis with factor 2. (2 marks)

Question 5 **(3 marks)**

The diagram below shows the unit circle with $s\angle AOB = \theta$ radians.



From the unit circle, state, correct to 0.01, the value for:

(a) $\cos\theta$ (1 mark)

(b) $\sin\theta$ (1 mark)

(c) $\cos(\theta+\pi)$ (1 mark)

Question 6 **(3 marks)**

A and ***B*** are acute angles with $\sin \boldsymbol{A} = \frac{3}{5}$ and $\cos \boldsymbol{B} = \frac{12}{13}$.

Determine the exact value of $\cos\ (\boldsymbol{A} - \boldsymbol{B})$.