Christ Church Grammar School

MATHEMATICS METHODS Year 11
Section One:
Calculator-free

Your name   _____

Teacher name _____

Time and marks available for this section
Reading time before commencing work: 3 minutes
Working time for this section: 30 minutes
Marks available: 29 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 using blue/black pen. Do not use erasable or gel pen.

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.

Question 1   **(6 marks)**

A trigonometric function is given as $f(x) = 5 - 3\cos(2x)$, for $0 \leq x \leq 2\pi$.

(a)   Describe the transformations which have been applied to the graph of
         $y = \cos x$ to obtain $f(x)$.   (3 marks)

(b)   Determine the coordinates of the minimum point(s) of $f(x)$.   (2 marks)

(c)   Describe the phase shift required to express $f(x)$ as a function of sine resulting
         in the same graph over the given domain.   (1 mark)

Question 2 **(3 marks)**

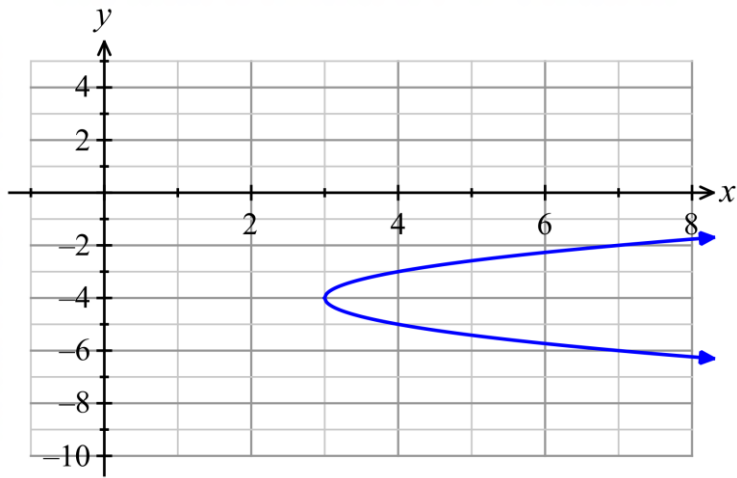Determine the centre and radius of the circle given by the equation:

$$x^2 + y^2 + 6x - 10y = 2.$$

Question 3   **(5 marks)**

A graph has been drawn below.

Determine:

(a)   with reason(s), if the graph is a relation or function.   (2 marks)

(b)   the equation of the axis of symmetry.   (1 mark)

(c)   the equation which represents the graph.   (2 marks)

See next page

Question 4 **(8 marks)**

Solve:

(a) $(2\cos x + 1)(\sin x - 2) = 0$ for $0 \le x \le 3\pi$. **(4 marks)**
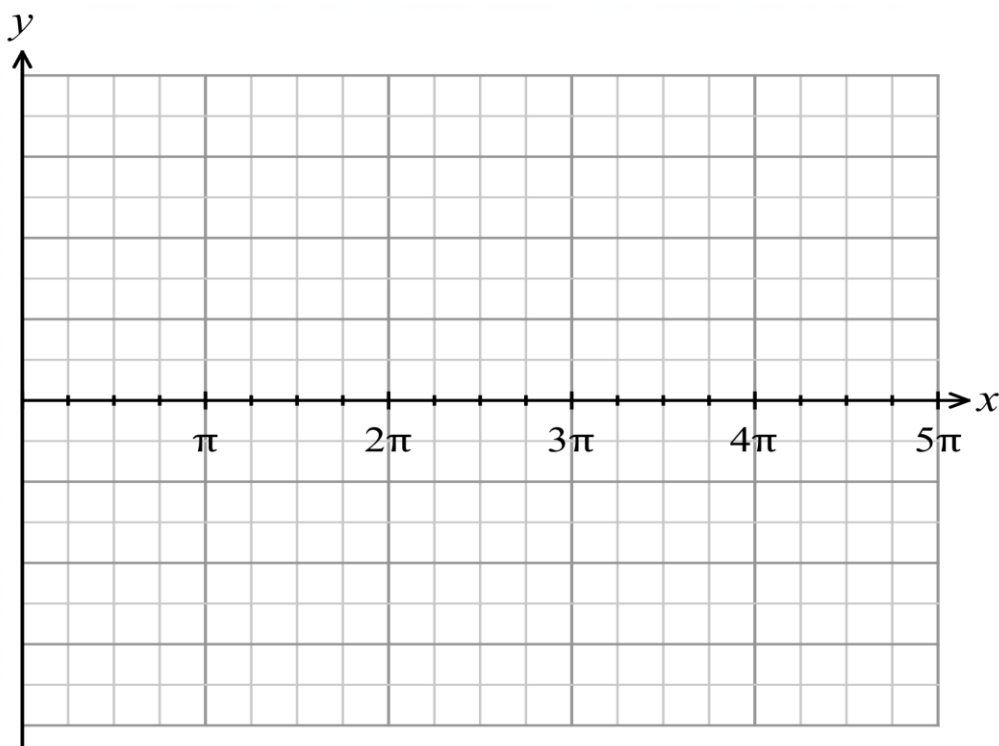
(b) $4(2\sin^2 x + \cos^2 x) - 6 = 0$ for $0 \le x \le 2\pi$. **(4 marks)**

Question 5 **(7 marks)**

(a) On the axes below, sketch the graph of $y = \tan\left(\frac{x}{3}\right)$ over the interval $0 \le x \le 5\pi$, clearly indicating the equations of any asymptotes. (3 marks)

(b) Solve the following equations over the interval $0 \le x \le 5\pi$, giving exact answers,

(i) $\tan\left(\frac{x}{3}\right) = -1$. (2 marks)

(ii) $\tan\left(\frac{x}{3}\right) - \sqrt{3} = 0$. (2 marks)

End of questions

Additional working space

Question number: _____

Additional working space

Question number: _____