

Semester Two Examination, 2022

Question/Answer booklet

MATHEMATICS
Year 11 METHODS
UNITS 1&2

Name: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Teacher: \_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_\_

Section One:
Calculator-free

Booklet 1 of 3

|  |  |
| --- | --- |
| Number of additionalanswer booklets used(if applicable): |  |

## 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 ofquestionsavailable | Number ofquestions tobe answered | Workingtime(minutes) | Marksavailable | Percentageofexamination |
| Section One:Calculator-free | 7 | 7 | 50 | 53 | 35 |
| Section Two:Calculator-assumed | 12 | 12 | 100 | 96 | 65 |
|  |  | **Total** | 100 |

## Instructions to candidates

1. 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.

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 answers to the specific question asked and to follow any instructions that are specific 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**seven** questions. Answer **all** questions. Write your answers in the spaces provided.

Working time: 50 minutes.

Question 1 (6 marks)

(a) Determine $\begin{matrix}d\\\overline{dx}\end{matrix}\left((4x+1)\left(x-3\right)\right)$. (2 marks)

(b) Determine $f'(-1)$ when $f\left(x\right)=x^{8}+3x^{5}-8x$. (2 marks)

(c) Determine the instantaneous rate of change of area $A$ when $t=2$ if the area of a region at time $t$ seconds is given by $A=\begin{matrix}11\\\overline{45}\end{matrix}+\begin{matrix}5t\\\overline{ 6 }\end{matrix}-\begin{matrix}2t^{2}\\\overline{ 3 }\end{matrix}+\begin{matrix}t^{3}\\\overline{ 9 }\end{matrix}$ cm2. (2 marks)

Question 2 (7 marks)

(a) Expand $\left(x+3\right)^{3}$. (2 marks)

(b) Solve the equation $\begin{matrix}x^{2}+6x\\\overline{x^{2}+4x+5}\end{matrix}=1$. (2 marks)

(c) Determine the centre and radius of the circle with equation $x^{2}+y^{2}-6y=0$. (3 marks)

Question 3 (7 marks)

(a) Determine $f\left(2\right)$ in simplified form when $f\left(x\right)=9^{0.5-x}$. (2 marks)

(b) Determine the value of $a^{2}÷b$ in scientific notation when $a=8×10^{-3}$ and $b=1.6×10^{-2}$.

 (2 marks)

(c) Solve the equation $\sqrt{10 000^{x}}=0.1\sqrt{10}$. (3 marks)

Question 4 (7 marks)

(a) Given $\begin{matrix}dh\\\overline{dt}\end{matrix}=12t^{3}-12t-1$ and $h=30$ when $t=2$, determine the value of $h$ when $t=1$.

 (3 marks)

(b) The height $h$ metres above the ground
of a small body $t$ seconds after it is
projected vertically upwards is shown
in the position-time graph.

 (i) Given that $h=at^{2}+bt$, where $a$ and $b$ are constants, show that the values for$ a$ and $b$ are $-5$ and $50$ respectively. (2 marks)

 (ii) Hence, determine the speed of the body when $t=3.8$. (2 marks)

Question 5 (9 marks)

(a) Solve the equation $4sin^{2}\left(\begin{matrix}x\\\overline{2}\end{matrix}\right)-1=0$ for $0\leq x\leq 2π$. (3 marks)

(b) The periodic function $f$ is defined as $f\left(x\right)=2\cos(\left(\begin{matrix}x\\\overline{2}\end{matrix}\right))+4$, where $x$ is measured in degrees.

(i) State the amplitude and period of $f$. (2 marks)

(ii) Sketch the graph of $y=f(x)$ on the axes below over the domain $0\leq x\leq 720°$.

 (3 marks)



(iii) State the range of $f$. (1 mark)

Question 6 (8 marks)

Let $f\left(x\right)=\begin{matrix}1\\\overline{4}\end{matrix} (x-4)(x-8)$.

(a) Determine the equation of the tangent to the curve $y=f(x)$ when $x=0$. (4 marks)

(b) The tangent to the curve $y=f(x)$ at $(2, 3)$ is perpendicular to the tangent to the same curve at point $P$.

 (i) Determine the gradient of the tangent at P. (1 mark)

 (ii) Determine the equation of the tangent at $P$. (3 marks)

Question 7 (9 marks)

Let $f\left(x\right)=x^{3}+3x^{2}-4$.

(a) Show that $f\left(1\right)=0$ and hence factorise $f(x)$. (3 marks)

(b) Determine the location of the stationary points of the curve $y=f(x)$. (3 marks)

(c) Sketch the graph of $y=f(x)$. (3 marks)



Supplementary page

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

Supplementary page

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

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