1

NAME: _____YEAR/HOUSE: _____

TEACHER'S NAME: Students circle Mr Jones Mr James Mrs Itter

SEMESTER 2 EXAMINATIONS NOVEMBER 2016

Year Eleven Mathematical Methods

Reading time: 15 Minutes
Writing time: 60 Minutes

Marks Allocated:

Section	Number of Questions	Number of Marks
Section A: Short Answer	10 Questions	40 Marks

Specific Instructions

- Calculators, summary books or aids of any kind are NOT permitted in this exam.
- Answer all questions in the spaces provided.
- In all questions where a numerical answer is required, an exact value must be given unless otherwise specified.
- In questions where more than one mark is available, appropriate working must be shown.
- Unless otherwise indicated, the diagrams in this book are not drawn to scale.

Supplies and Equipment

Supplies: Please ensure you have the correct supplies/instruments for taking the examination before you enter the examination venue (e.g. pencils, pens, calculator, ruler, etc). There will be no sharing allowed. No other paper, etc. will be allowed to come in with you unless instructed as Specific Instructions. A clear bottle containing only water is permissible.

At the Conclusion: Please wait quietly for specific instruction as to how you will be dismissed. Leave your examination paper on your table. Pick up unwanted papers around you, push your chair under the table, and put your rubbish in the bin on your way out of the examination room.

Section A: Short Answer (10 questions: 40 Marks)

Question 1 (3 marks)

Solve the following for *x*.

a. $5^{2x+3} = \frac{1}{25}$ 1 mark

b. $\log_2(3x) + 2\log_2(x) - \log_2(6) = -1$ 2 marks

Question 2 (6 marks)

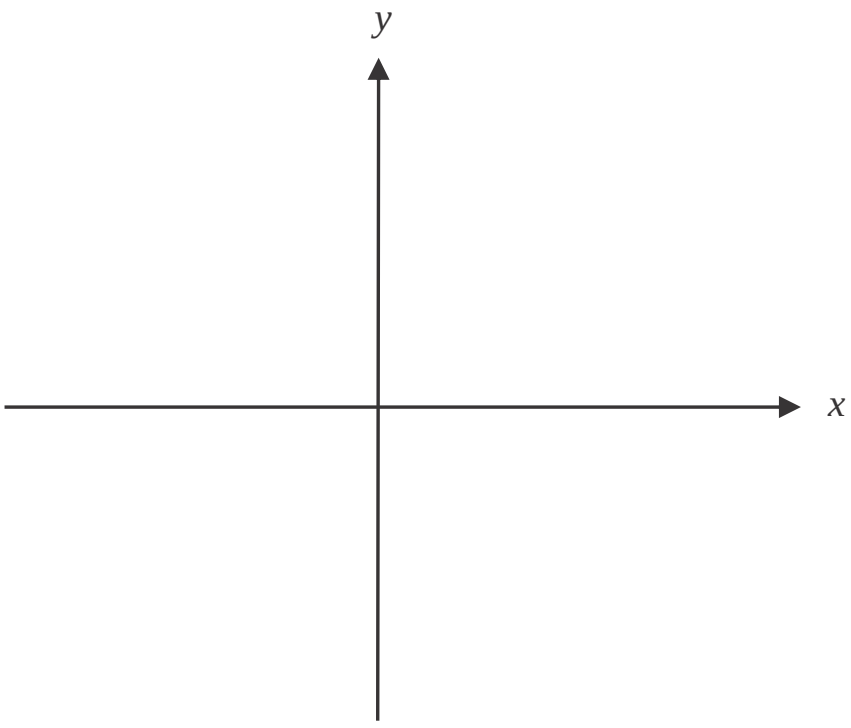
Consider the polynomial $P(x) = x^3 - x^2 - 2x + 2$. The equation $P(x) = 0$ has three real solutions.

a. Show that $x - 1$ is a linear factor. 1 mark

b. Hence or otherwise find all the linear factors of $P(x)$. 2 marks

c. Sketch the graph of $P(x) = x^3 - x^2 - 2x + 2$ on the set of axes below.
Indicate clearly all axes intercepts. It is not necessary to find the turning points.

3 marks



Question 3 (3 marks)

a. If $y = 3x^2 - 5x - 2$, find $\frac{dy}{dx}$. 1 mark

b. Given that $g(x) = 4\sqrt{x} - \frac{3}{x^2}$, find $g'(x)$. 2 marks

Question 4 (6 marks)

a. On the set of axes below, sketch the graph of $y = \sqrt{2}\sin\left(\frac{x}{2}\right)$ for $x \in [0, 6\pi]$. Indicate clearly any axes intercepts and endpoints as well as the amplitude of the graph.

3 marks

b. Solve the equation $\sqrt{2}\sin\left(\frac{x}{2}\right)=1$ for $x \in [0,6\pi]$. 3 marks

Question 5 (4 marks)

a. Evaluate

i. $\cos\left(\frac{2\pi}{3}\right)$ 1 mark

ii. $\sin\left(-\frac{3\pi}{2}\right)$ 1 mark

b. Given $\sin(\theta)=0.6$ and $\frac{\pi}{2}<\theta<\pi$, evaluate

i. $\cos(\theta)$ 1 mark

ii. $\tan(\theta)$ 1 mark

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Question 6 (3 Marks)

A particular weekly flight is late to leave 30% of the time. Find the probability that in the coming four weeks this particular flight is late

a. on all four occasions.

_____

_____

_____

1 mark

b. on at least one occasion.

_____

_____

_____

_____

2 marks

Question 7 (4 marks)

A group of two boys and three girls line up in a straight line.

c. In how many different ways can the children be arranged in this line? 1 mark

Two of the children are randomly selected from the group.

d. How many different selections can be made? 1 mark

i. What is the probability that one boy and one girl are selected? 2 marks

Question 8 (4 marks)

The gradient of a straight line is 2. The straight line is a tangent to the curve with equation $y = x^2 - 4x + 1$. Find the equation of the straight line.

Question 9 (3 marks)

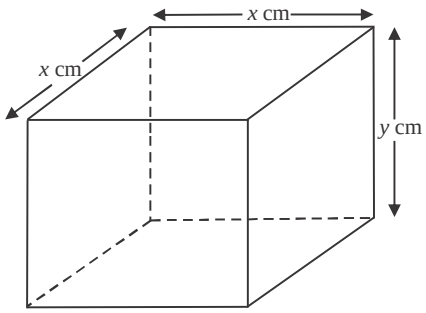
a. Show that the stationary points of the graph of $y = x^4 - 5x^3 - 2x^2$ occur at the points where $x = -\frac{1}{4}, x = 0 \text{ and } x = 4$.

2 marks

b. Find the values of *x* for which the function $f : [-1, 1] \to R,\ f(x) = x^4 - 5x^3 - 2x^2$ has a positive gradient. 1 mark

Question 10 (4 marks)

A cardboard box is in the shape of a square prism with side lengths of x cm and y cm as shown in the diagram below.



The sum of all the side lengths of the box is 120 cm.

a. Show that the total surface area A, in cm^2, of the box is given by $A = -6x^2 + 120x$.

2 marks

b. Find the maximum surface area of the box and the value of x when this maximum occurs.

2 marks

END OF SECTION A