TSSM
Creating VCE Success

THIS BOX IS FOR ILLUSTRATIVE PURPOSES ONLY

'2016 Examination Package' -
Trial Examination 4 of 5

STUDENT NUMBER

									Letter
Figures									
Words									

SPECIALIST MATHEMATICS

Units 3 & 4 – Written examination 1

*(*TSSM's *2014 trial exam updated for the current study design)*

Reading time: 15 minutes
Writing time: 1 hour

QUESTION AND ANSWER BOOK

Structure of book

Number of questions	*Number of questions to be answered*	*Number of marks*
8	8	40

- Students are permitted to bring into the examination room: pens, pencils, highlighters, erasers, sharpeners, and rulers.
- Students are NOT permitted to bring into the examination room: notes of any kind, a calculator, blank sheets of paper and/or white out liquid/tape.

Materials supplied
- Question and answer book of 10 pages.
- Working space is provided throughout the book.

Instructions
- Print your name in the space provided on the top of this page.
- All written responses must be in English.

Students are NOT permitted to bring mobile phones and/or any other electronic devices into the examination room.

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Instructions

Answer **all** questions in the spaces provided.
A decimal approximation will not be accepted if an **exact** answer is required to a question.
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.
Take the **acceleration due to gravity** to have magnitude g m/s^2, where $g = 9.8$.

Question 1 (4 marks)

Evaluate $\int_4^6 \frac{3-2x}{x^2-4x+3}\,dx$

TURN OVER

Question 2 (5 marks)

Points $A(-1, 2, 4)$, $B(1, 0, 5)$ and $C(3, 5, 2)$ are three vertices of a triangle.

a. Find $\left|\vec{AB}\right|$

2 marks

b. Show that the triangle is right angled at A.

2 marks

c. Find the area of triangle ABC.

1 mark

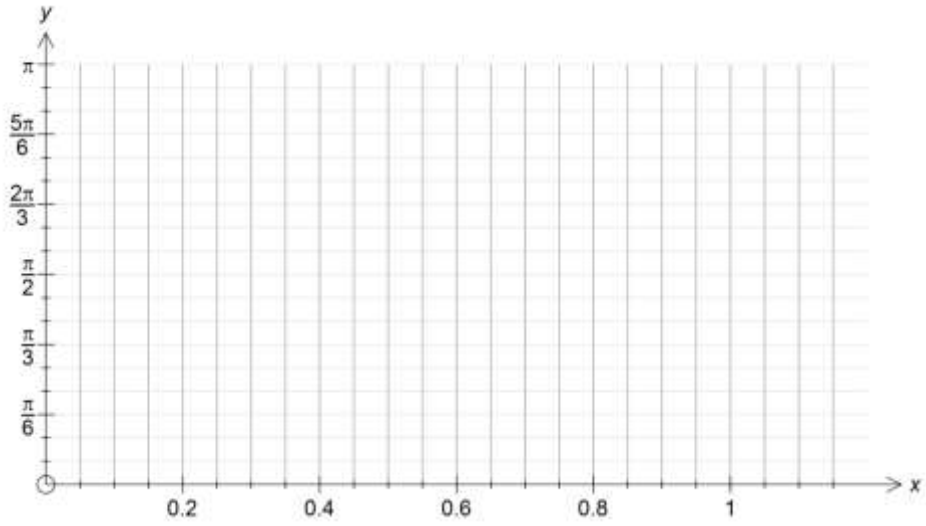
Question 3 (7 marks)

Consider the function $f(x) = \arccos(2-3x)$

a. Find the maximal domain of $f(x)$

2 marks

b. Sketch the graph of $y = f(x)$ over its maximal domain on the axes below. Label the end points.



2 marks

c. Find the gradient of the normal to the graph of $y = f(x)$ at $y = \frac{\pi}{3}$

3 marks

TURN OVER

Question 4 (4 marks)

a. Verify $z = 3i$ is a solution of the equation $z^3 - 2z^2 + 9z - 18 = 0$

1 mark

b. Find all solutions for the equation $z^3 - 2z^2 + 9z - 18 = 0$ over *C*, in Cartesian form.

3 marks

Question 5 (5 marks)

Consider the relation $2y - xy^2 + 5x = -6$

a. Find an expression for $\frac{dy}{dx}$ in terms of x and y

3 marks

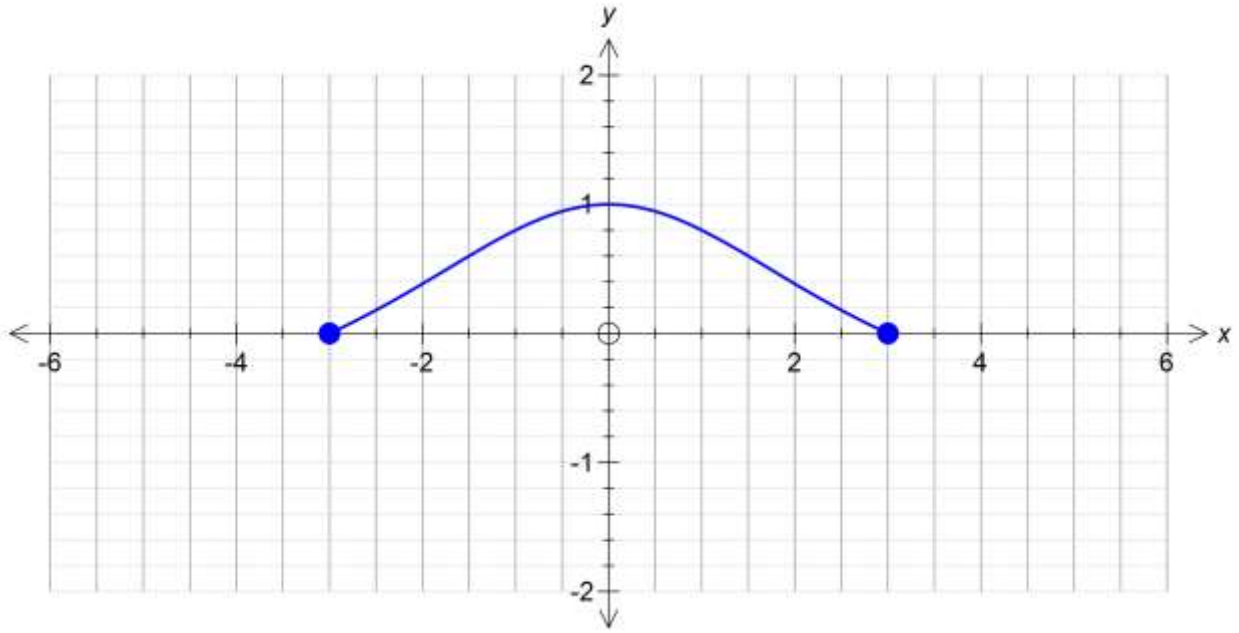
b. Find the exact value of $\frac{dy}{dx}$ when $y = 1$.

2 marks

TURN OVER

Question 6 (4 marks)

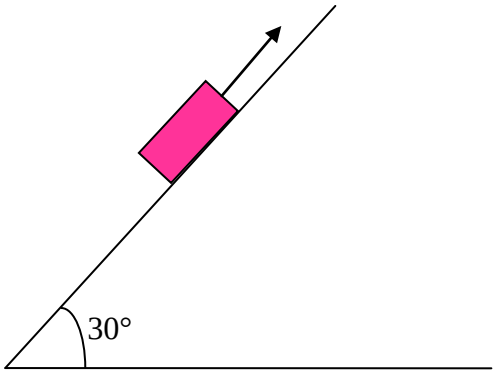
The graph of $y = \dfrac{4}{x^2 + 9} - 1 \quad for \quad -3 \le x \le 3$ is shown below



The region enclosed by the curve and the coordinate axes in the **first** quadrant is rotated about the *y* axis to form a solid of revolution. Express the volume of this solid as a definite integral and **hence** find the exact volume of the solid.

Question 7 (6 marks)

A particle of mass 5kg lies on a plane inclined at 30° to the horizontal. There is a force of 15N, acting up the plane, that resists motion.



a. On the diagram above, show all other forces acting on the body and label them.

2 marks

b. Find the acceleration of the particle down the incline.

2 marks

c. Find the normal reaction force *R*.

2 marks

TURN OVER

Question 8 (5 marks)

A hot iron bar with a temperature of 80°C is placed in a room which has temperature of 20°C. The iron bar cools to 70°C in five minutes.

Let T be the temperature of the bar after t minutes.

a. Use Newton's law of cooling, $\frac{dT}{dt} = -k(T - 20)$ to find the exact value of k.

3 marks

b. Find the temperature of the bar after 10 minutes.

2 marks

Total 5 marks

END OF QUESTION AND ANSWER BOOK