



## MATHEMATICS SPECIALIST Year 12

### Section One: Calculator-free

Student name \_\_\_\_\_

Teacher name \_\_\_\_\_

#### **Time and marks available for this section**

Reading Time:	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. Write your answers in this Question/Answer Booklet.
2. Answer all questions.
3. 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.
4. 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
5. **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.
6. It is recommended that **you do not use pencil**, except in diagrams.

**Question 1****(5 marks)**

The fraction  $\frac{5x+11}{(x+1)(x+3)}$  can be re-written as the sum of two fractions.

That is  $\frac{5x+11}{(x+1)(x+3)} = \frac{A}{(x+1)} + \frac{B}{(x+3)}$ , where A and B are real numbers.

(a) Calculate the values of A and B.

**(3 marks)**

(b) Hence or otherwise integrate the following function:

$$\int \frac{5x+11}{(x+1)(x+3)} dx$$

**(2 marks)**

**Question 2****(7 marks)**

Integrate each of the following:

(a)  $\int \cos^2\left(\frac{x}{4}\right) dx$

**(3 marks)**

(b)  $\int \frac{x^3}{x^2-1} dx$

**(4 marks)**

**Question 3****(4 marks)**

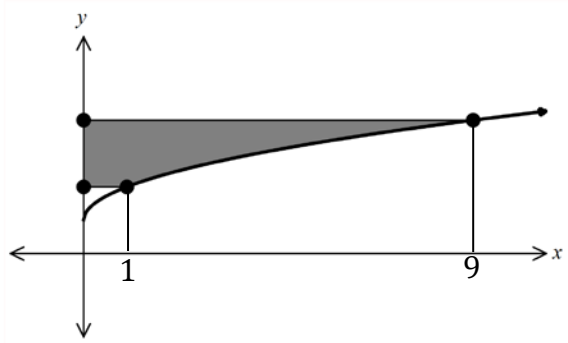
Calculate the exact area of the following integral using the substitution of  $u = 4 - x^2$ , if required.

$$\int_0^2 x e^{4-x^2} dx.$$

Question 4

(4 marks)

Calculate the area trapped between the function  $y = \frac{\sqrt{x+1}}{2}$  and the y-axis in the interval  $1 \leq x \leq 9$ .



**Question 5****(4 marks)**

Calculate the exact value of the following integral in terms of  $c$ .

$$\int_0^c \frac{x}{\sqrt{x^2 + 4}} dx$$

## Question 6

(6 marks)

Integrate the following function using the substitution  $x = 3\sin\theta$ :

$$\int \frac{x^2}{\sqrt{9-x^2}} dx$$

**End of questions**



**Additional working space**

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

**Additional working space**

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



## MATHEMATICS SPECIALIST Year 12

### Section Two:

### Calculator-assumed

Student name \_\_\_\_\_

Teacher name \_\_\_\_\_

#### **Time and marks available for this section**

Reading time before commencing work: 2 minutes  
Working time for this section: 15 minutes  
Marks available: 15 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, and up to three calculators approved for use in the WACE examinations

#### **Important note to candidates**

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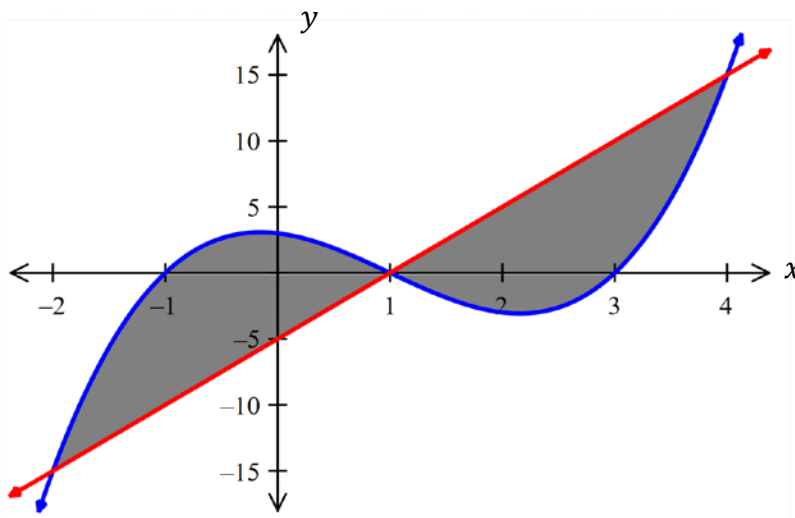
**Instructions to candidates**

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2. Answer all questions.
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5. **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.
6. It is recommended that **you do not use pencil**, except in diagrams.

**Question 7****(2 marks)**

Integrate the following, give answers to 2 decimal places if necessary.

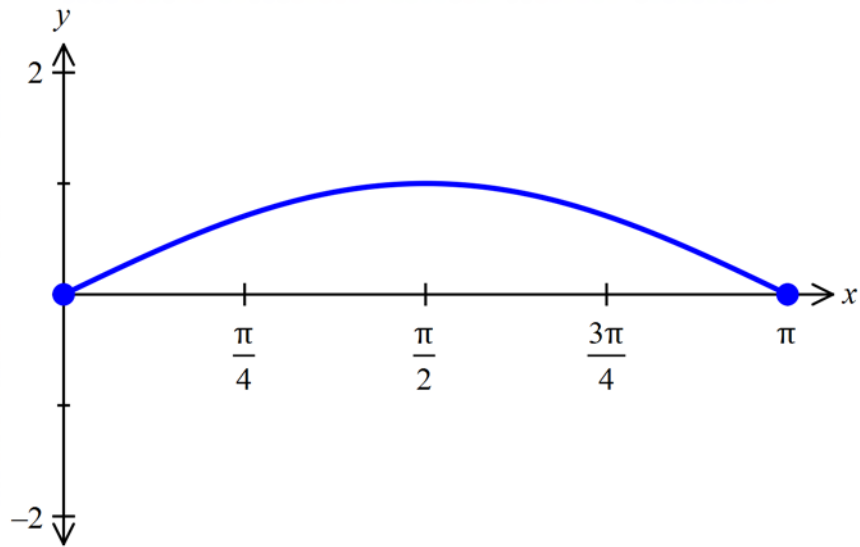
$$\int_1^2 \left(x^2 + \frac{1}{x}\right)^4 dx$$

**Question 8****(3 marks)**The curve has an equation  $y = (x + 1)(x - 1)(x - 3)$  and the straight line has equation  $y = 5x - 5$ . Calculate the total shaded area.

See next page

## Question 9

(3 marks)

Let  $f(x) = x \sin(x)$ , for  $0 \leq x \leq \pi$ .If this shape is rotated about the  $x$ -axis through  $360^\circ$ 

(a) Write down an expression for this volume of revolution. (2 marks)

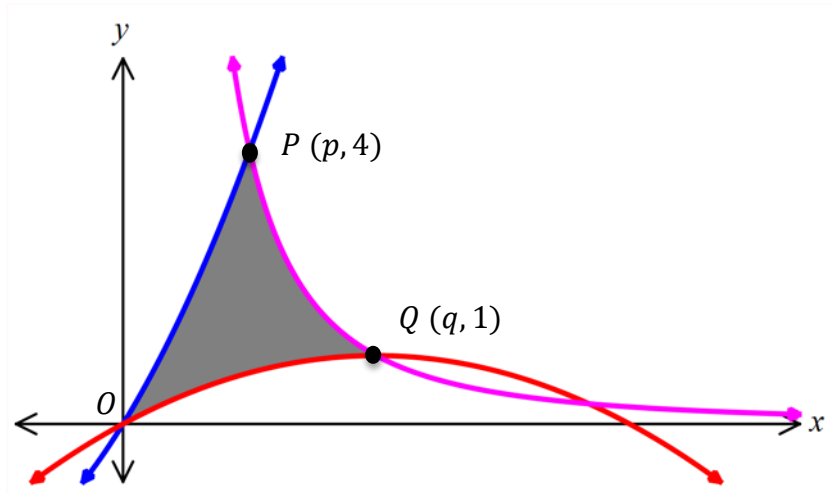
(b) Calculate the volume. (1 mark)

**Question 10**

**(7 marks)**

The origin,  $O$  and the points  $P$  and  $Q$  are the vertices of a curved “triangle” which is shaded in the diagram.

The sides lie on the curve with the equations  $y = x(x + 3)$ ,  $y = x - \frac{1}{4}x^2$  and  $y = \frac{4}{x^2}$ .



- (a)  $P$  and  $Q$  have coordinates  $(p, 4)$  and  $(q, 1)$ . Find the values of  $p$  and  $q$ . (2 marks)

- (b) Calculate the shaded area, clearly indicating anything you type into your ClassPad. (5 marks)

**Additional working space**

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



**Additional working space**

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