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**Mathematics**  
**Standard level**  
**Paper 1**

Monday 13 May 2019 (afternoon)

Candidate session number

1 hour 30 minutes

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**Instructions to candidates**

- Write your session number in the boxes above.
- Do not open this examination paper until instructed to do so.
- You are not permitted access to any calculator for this paper.
- Section A: answer all questions. Answers must be written within the answer boxes provided.
- Section B: answer all questions in the answer booklet provided. Fill in your session number on the front of the answer booklet, and attach it to this examination paper and your cover sheet using the tag provided.
- Unless otherwise stated in the question, all numerical answers should be given exactly or correct to three significant figures.
- A clean copy of the **mathematics SL formula booklet** is required for this paper.
- The maximum mark for this examination paper is **[90 marks]**.



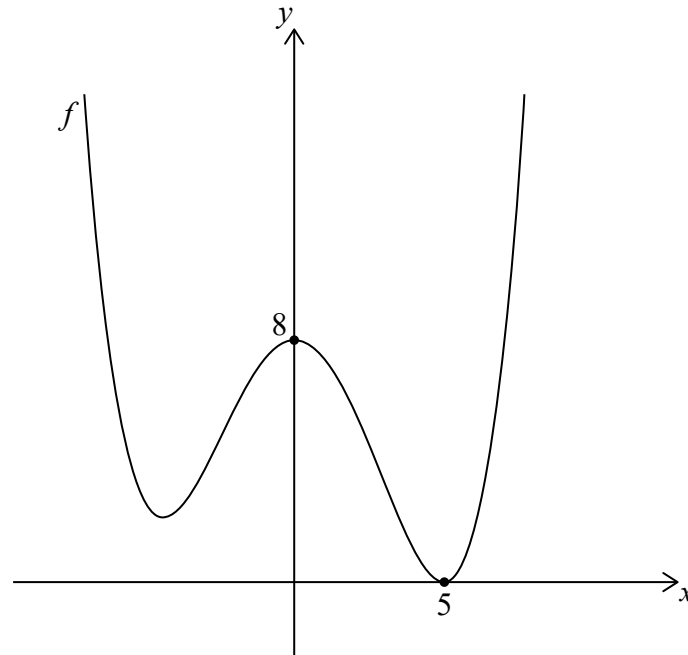






4. [Maximum mark: 7]

The following diagram shows part of the graph of  $f$  with  $x$ -intercept  $(5, 0)$  and  $y$ -intercept  $(0, 8)$ .



(a) Find the  $y$ -intercept of the graph of

(i)  $f(x) + 3$ ;

(ii)  $f(4x)$ .

[3]

(b) Find the  $x$ -intercept of the graph of  $f(2x)$ .

[2]

(c) Describe the transformation  $f(x + 1)$ .

[2]

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5. [Maximum mark: 6]

Consider the function  $f(x) = (1 - k)x^2 + x + k$ ,  $x \in \mathbb{R}$ . Find the value of  $k$  for which  $f(x)$  has two equal real roots.

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6. [Maximum mark: 7]

Solve  $\log_4(2 - x) = \log_{16}(13 - 4x)$ .

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Do **not** write solutions on this page.

### Section B

Answer **all** questions in the answer booklet provided. Please start each question on a new page.

8. [Maximum mark: 16]

A group of 10 girls recorded the number of hours they spent watching television during a particular week. Their results are summarized in the box-and-whisker plot below.



(a) The range of the data is 16. Find the value of  $a$ . [2]

(b) Find the value of the interquartile range. [2]

The group of girls watched a total of 180 hours of television.

(c) Find the mean number of hours that the girls in this group spent watching television that week. [2]

A group of 20 boys also recorded the number of hours they spent watching television that same week. Their results are summarized in the table below.

$\bar{x} = 21$	$\sigma = 3$
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(d) (i) Find the total number of hours the group of boys spent watching television that week.  
 (ii) Find the mean number of hours that **all 30** girls and boys spent watching television that week. [5]

The following week, the group of boys had exams. During this exam week, the boys spent half as much time watching television compared to the previous week.

(e) For this exam week, find  
 (i) the mean number of hours that the group of boys spent watching television;  
 (ii) the variance in the number of hours the group of boys spent watching television. [5]



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9. [Maximum mark: 15]

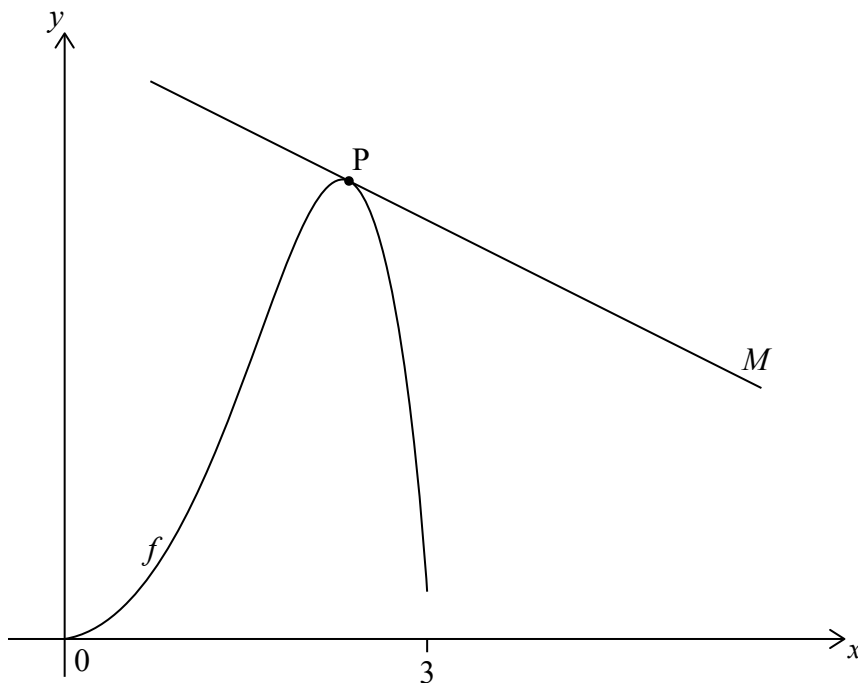
Let  $\theta$  be an **obtuse** angle such that  $\sin \theta = \frac{3}{5}$ .

- (a) Find the value of  $\tan \theta$ . [4]
- (b) Line  $L$  passes through the origin and has a gradient of  $\tan \theta$ . Find the equation of  $L$ . [2]

Let  $f(x) = e^x \sin x - \frac{3x}{4}$ .

- (c) Find the derivative of  $f$ . [5]

The following diagram shows the graph of  $f$  for  $0 \leq x \leq 3$ . Line  $M$  is a tangent to the graph of  $f$  at point  $P$ .



- (d) Given that  $M$  is parallel to  $L$ , find the  $x$ -coordinate of  $P$ . [4]



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10. [Maximum mark: 14]

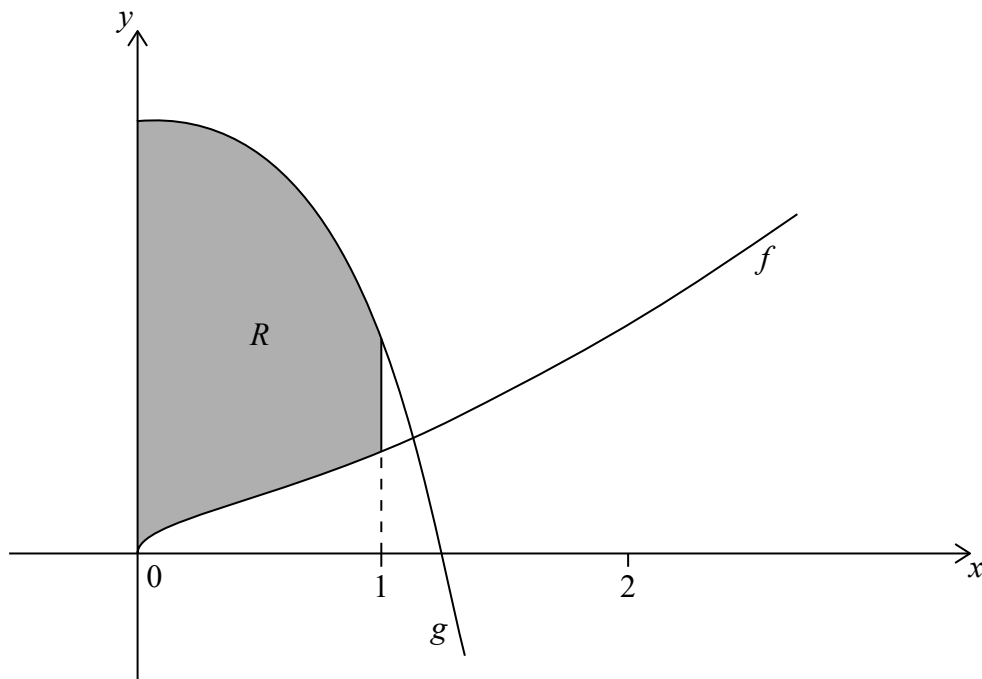
Let  $y = (x^3 + x)^{\frac{3}{2}}$ .

(a) Find  $\frac{dy}{dx}$ . [3]

(b) Hence find  $\int (3x^2 + 1)\sqrt{x^3 + x} \, dx$ . [3]

Consider the functions  $f(x) = \sqrt{x^3 + x}$  and  $g(x) = 6 - 3x^2\sqrt{x^3 + x}$ , for  $x \geq 0$ .

The graphs of  $f$  and  $g$  are shown in the following diagram.



The shaded region  $R$  is enclosed by the graphs of  $f$ ,  $g$ , the  $y$ -axis and  $x = 1$ .

(c) Write down an expression for the area of  $R$ . [2]

(d) Hence find the exact area of  $R$ . [6]



Please **do not** write on this page.

Answers written on this page  
will not be marked.

