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7782727873

ADDITIONAL MATHEMATICS **0606/11**

Paper 1 Non-calculator **October/November 2025**

2 hours

You must answer on the question paper.

No additional materials are needed.

INSTRUCTIONS

- Answer **all** questions.
- Use a black or dark blue pen. You may use an HB pencil for any diagrams or graphs.
- Write your name, centre number and candidate number in the boxes at the top of the page.
- Write your answer to each question in the space provided.
- Do **not** use an erasable pen or correction fluid.
- Do **not** write on any bar codes.
- Calculators must **not** be used in this paper.
- You must show all necessary working clearly.

INFORMATION

- The total mark for this paper is 80.
- The number of marks for each question or part question is shown in brackets [ ].

This document has **16** pages.

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List of formulas

Equation of a circle with centre (a, b) and radius r. $(x-a)^2 + (y-b)^2 = r^2$

Curved surface area, A, of cone of radius r, sloping edge l. $A = \pi rl$

Surface area, A, of sphere of radius r. $A = 4\pi r^2$

Volume, V, of pyramid or cone, base area A, height h. $V = \frac{1}{3}Ah$

Volume, V, of sphere of radius r. $V = \frac{4}{3}\pi r^3$

Quadratic equation

For the equation $ax^2 + bx + c = 0$,

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

Binomial theorem

$$(a+b)^n = a^n + \binom{n}{1}a^{n-1}b + \binom{n}{2}a^{n-2}b^2 + \ldots + \binom{n}{r}a^{n-r}b^r + \ldots + b^n,$$

where n is a positive integer and $\binom{n}{r} = \frac{n!}{(n-r)!r!}$

Arithmetic series

$$u_n = a + (n-1)d$$
$$S_n = \frac{1}{2}n(a+l) = \frac{1}{2}n\{2a + (n-1)d\}$$

Geometric series

$$u_n = ar^{n-1}$$
$$S_n = \frac{a(1-r^n)}{1-r} \quad (r \neq 1)$$
$$S_\infty = \frac{a}{1-r} \quad (|r| < 1)$$

Identities

$$\sin^2 A + \cos^2 A = 1$$
$$\sec^2 A = 1 + \tan^2 A$$
$$\operatorname{cosec}^2 A = 1 + \cot^2 A$$

Formulas for ΔABC

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$
$$a^2 = b^2 + c^2 - 2bc\cos A$$
$$\Delta = \frac{1}{2}ab\sin C$$

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Calculators must **not** be used in this paper.

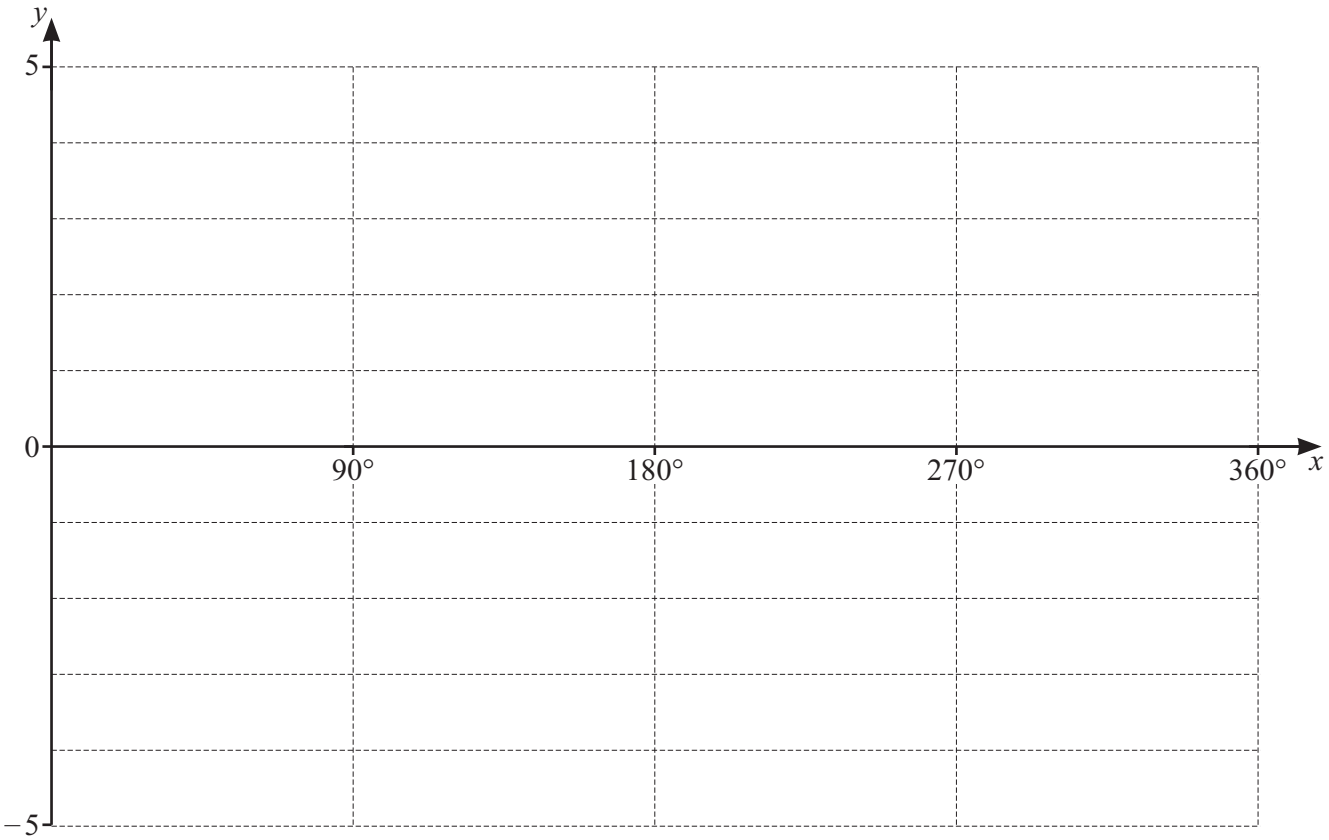
1 **(a)** Write down the amplitude and period of $3\cos 2x - 1$.

Amplitude = ...

Period = ...

[2]

(b) Sketch the graph of $y = 3\cos 2x - 1$ for $0° \leqslant x \leqslant 360°$. [3]



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2 Find the set of values of k for which the line $y = kx - 3$ meets the curve $y = x^2 + 2x$ at two distinct points.
Give your answer in simplest surd form. [6]

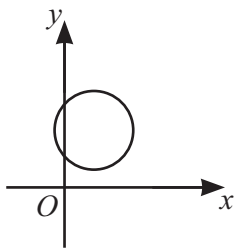
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3 **(a)** Solve the equation $\log_2 x - 4 = 5\log_x 2$. [5]

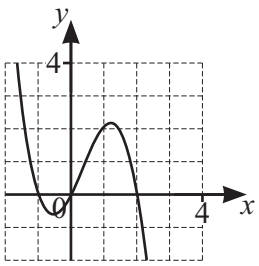
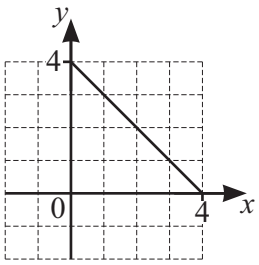
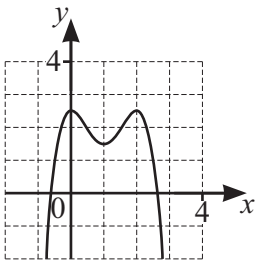
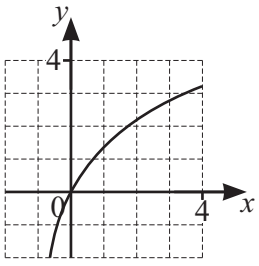
(b) Solve the equation $e^{x^2-3} = 25e^{7-x^2}$. [4]

4 (a)



Explain why this graph does **not** represent a function. [1]

(b) The table shows the graphs of four different functions.

	is one-one	is many-one	is its own inverse
			
			
			
			

Tick (✓) each correct box in the table.
There may be more than one tick in a row or a column. [4]

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(c) Functions f and g are defined as follows.

$\text{f}: x \mapsto \sin x$ for $30° \leqslant x \leqslant a°$

$\text{g}: x \mapsto \sqrt{x - \frac{1}{2}}$ for $x \geqslant \frac{1}{2}$

It is given that the function gf exists.

(i) Find the value of a so that the domain of gf is as large as possible.

You may use the information that $\sin 30° = \frac{1}{2}$. [2]

(ii) For the domain found in **part (i)**, find the range of the function gf. [2]

(iii) Determine whether the function g^2 exists. [1]

5 **(a)** In an arithmetic progression:

- the first term is 3
- the sum of the first 10 terms is 4 times the sum of the first 5 terms.

Find the common difference. [3]

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(b) The 1st, 2nd and 5th terms of another arithmetic progression are the 1st, 2nd and 3rd terms of a geometric progression.

It is given that the 1st terms of the progressions are **not** 0.
Find the common ratio, r, where $r \neq 1$, of the geometric progression. [4]

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6 Solve the equation $\left|x^2 - 5x\right| = 6$. [5]

7 **(a)** Differentiate $\dfrac{\sin x + \cos x}{e^{1-3x}}$ with respect to x. [4]

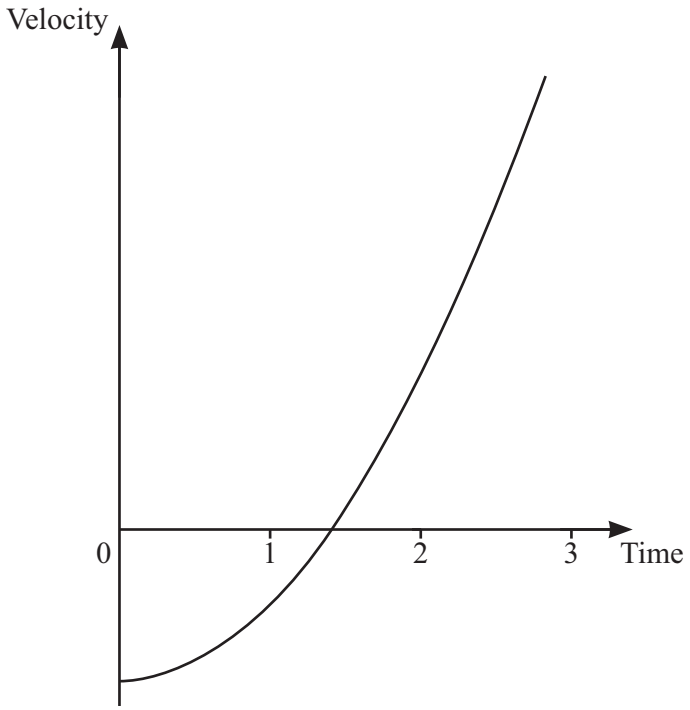
(b) Find $\int \left(1 + \tan^2 3x\right) dx$. [3]

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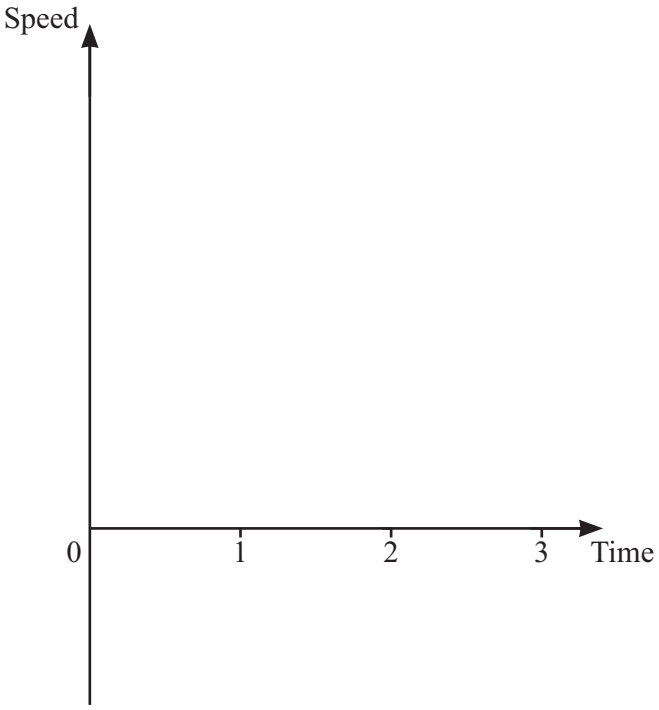
8 Solve the simultaneous equations $\frac{x}{2y} - \frac{4y}{x} = -1$ and $x = 1 - 6y$. [5]

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9 The diagram shows the velocity–time graph for a particle moving in a straight line.



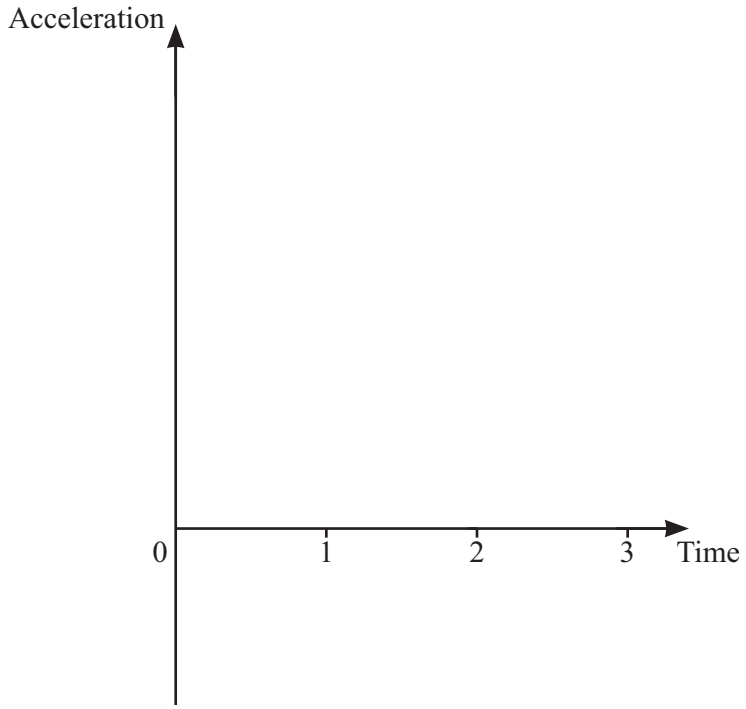
(a) On the diagram below, sketch the speed–time graph for the motion of this particle. [1]



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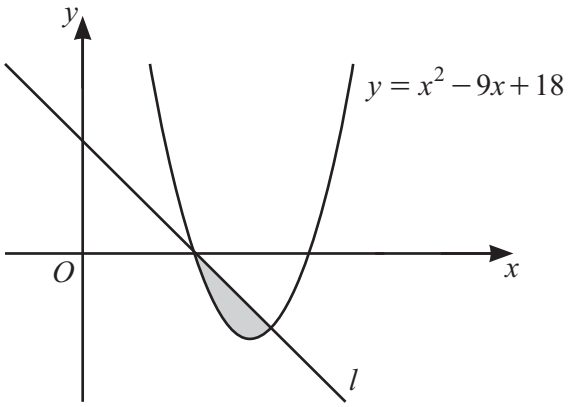
It is given that the velocity–time graph is part of a quadratic curve.
The curve has gradient 0 when time is 0.

(b) On the diagram below sketch a possible acceleration–time graph for the motion of the particle. [2]



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10



The diagram shows the curve $y = x^2 - 9x + 18$ and the line l, which is the normal to this curve at the point where $x = 5$.

Find the area of the shaded region. [11]

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Continuation of working space for Question 10.

11 The number of permutations of n items taken 4 at a time is equal to $\frac{1}{6}\times$ the number of permutations of $2n$ items taken 3 at a time.

(a) Show that n satisfies the equation $3n^2 - 19n + 20 = 0$. [4]

(b) Hence find the value of n. [2]

Question 12 is printed on the next page.

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12 Solutions to this question by accurate drawing will not be accepted.

Relative to an origin O, the position vectors of the points A, B and C are $\overrightarrow{OA} = \begin{pmatrix} 1 \\ 7 \end{pmatrix}$, $\overrightarrow{OB} = \begin{pmatrix} 7 \\ 4 \end{pmatrix}$ and $\overrightarrow{OC} = k\begin{pmatrix} 1 \\ 2 \end{pmatrix}$, where k is a scalar constant.

Given that C lies on the line AB, use a vector method to find the ratio $AC : AB$. [6]

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