Centre Number

Candidate Number

Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2017

Mathematics

Assessment Unit C1
assessing
Module C1:
AS Core Mathematics 1

MV18

[AMC11]
WEDNESDAY 17 MAY, MORNING

Time

1 hour 30 minutes, plus your additional time allowance.

Instructions to Candidates

Write your Centre Number and Candidate Number in the spaces provided at the top of this page.
You must answer **all eight** questions in the spaces provided.
Complete in black ink only.
Questions which require drawing or sketching should be completed using an H.B. pencil.
All working should be clearly shown in the spaces provided.
Marks may be awarded for partially correct solutions. **Answers without working may not gain full credit**.
Answers should be given to three significant figures unless otherwise stated.
You are not permitted to use any calculating aid in this paper.

Information for Candidates

The total mark for this paper is 75

Figures in brackets printed at the end of each question indicate the marks awarded to each question or part question.

A copy of the **Mathematical Formulae and Tables booklet** is provided.

Throughout the paper the logarithmic notation used is $\ln z$ where it is noted that $\ln z \equiv \log_e z$

1 **(a)** Simplify as far as possible   [4 marks]

$$\frac{3x^2 - 12}{x + 4} \times \frac{2x^2 + 7x - 4}{3x + 6}$$

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$$\frac{3x^2 - 12}{x + 4} \times \frac{2x^2 + 7x - 4}{3x + 6}$$

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(b) Solve the simultaneous equations   [6 marks]

$3x + 4y - z = 6$
$x - 2y + 3z = 12$
$4x + y - 2z = 11$

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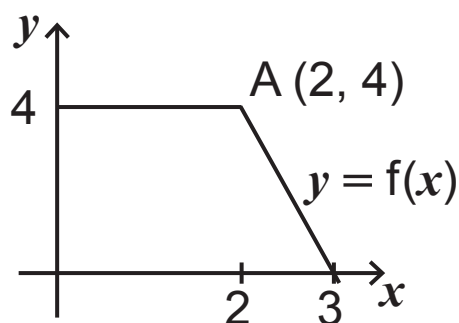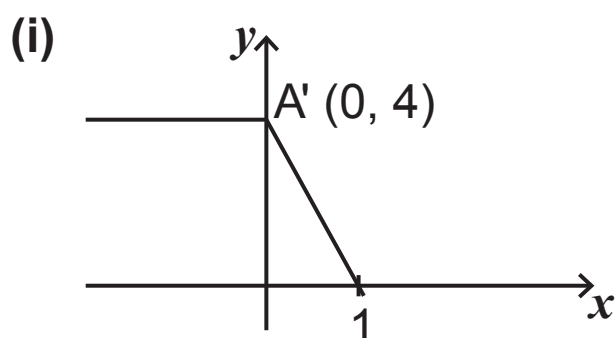**2** **Fig. 1** below shows a sketch of the graph of the function $y = f(x)$.
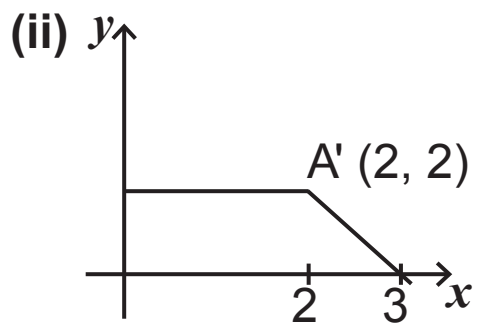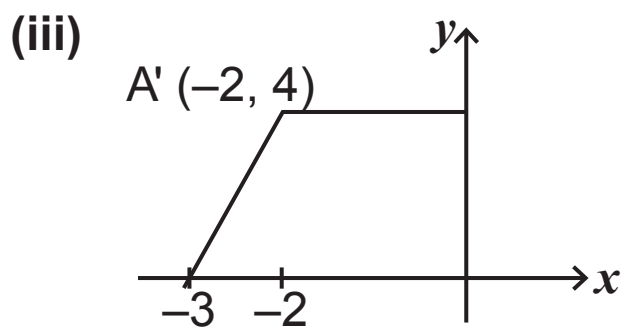

Fig. 1

Point A has coordinates (2, 4).
Each sketch below shows a single transformation of the function $y = f(x)$.

For each sketch, use function notation to describe the transformations shown.   [2 marks for each]

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3 A piece of timber, in the shape of a trapezium, is shown in **Fig. 2** below.
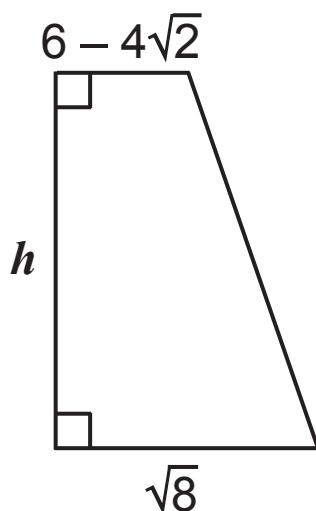
$6 - 4\sqrt{2}$

h

$\sqrt{8}$

Fig. 2

The parallel sides of the trapezium have lengths $(6 - 4\sqrt{2})$ metres and $\sqrt{8}$ metres.
The area of the piece of timber is $7\,\text{m}^2$

Find the exact value of h, leaving your answer in the form $a + \sqrt{b}$ [6 marks]

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4 **Fig. 3** below shows the rhombus ABCD.
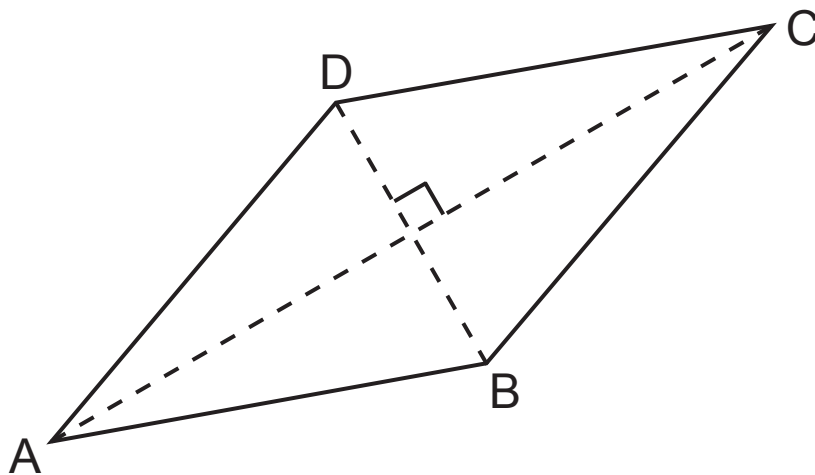

Fig. 3

Point A has coordinates (–2, 1).
Point C has coordinates (3, 11).

Find the equation of the line BD.   [6 marks]
Leave your answer in the form $ax + by + c = 0$,
where a, b and c are integers.

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5 **(a)** When the expression $(ax^2 + 8x + 20)$ is divided by $(x + 3)$ the remainder is a.

Find the value of a.   [3 marks]

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(b) Solve

$3(2x + 1) - (x + 3)(x - 1) < 0$ [7 marks]

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6 Find the equation of the tangent to the curve

$$y = 4\sqrt{x} - \frac{x^2}{2} \qquad (x > 0)$$

at the point where the curve crosses the x-axis. [8 marks]

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7 **(a)** Solve the simultaneous equations   [8 marks]

$$8^x \times 16^{y-1} = \sqrt{32}$$

$$4x + 2y = 7$$

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(b) Show that the curves given by the equations

$$y = 2 - \frac{1}{x}$$

and $y = \dfrac{1}{2-x}$

touch each other.   [6 marks]

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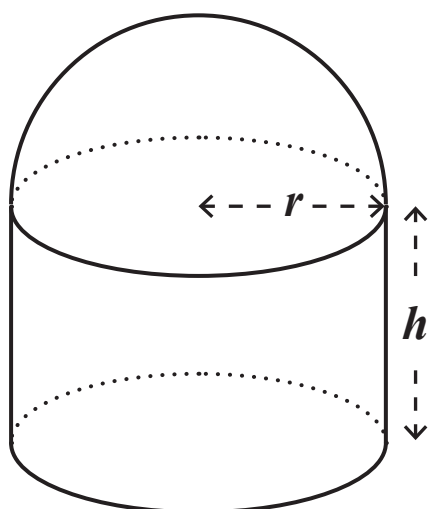**8** **Fig. 4** below shows the design of a hollow metal casing.

Fig. 4

The casing consists of a circular base, open cylinder and open hemisphere, all with common radius.
The cylinder has radius r metres and height h metres.
The casing has volume $\frac{\pi}{3}$ m^3

[Volume of sphere = $\frac{4}{3}\pi r^3$, Surface area of sphere = $4\pi r^2$]

(i) Show that

$$h = \frac{1 - 2r^3}{3r^2}$$ [4 marks]

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(ii) Hence show that S, the total surface area of the casing, can be expressed as

$$S = \frac{5\pi r^2}{3} + \frac{2\pi}{3r}$$ [4 marks]

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The total surface area of the casing

$$S = \frac{5\pi r^2}{3} + \frac{2\pi}{3r}$$

is to be coated with expensive heat-resistant paint.

(iii) Using calculus, find the value of r for which the total surface area is kept to a minimum. [7 marks]

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THIS IS THE END OF THE QUESTION PAPER

10435.04 **MV18**