Centre Number

Candidate Number

Rewarding Learning

ADVANCED SUBSIDIARY (AS)
General Certificate of Education
2019

Mathematics

Assessment Unit C1
assessing
Module C1:
AS Core Mathematics 1

MV18

[AMC11]
MONDAY 13 MAY, AFTERNOON

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.
Do not write on blank pages.
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.

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Information for Candidates

The total mark for this paper is 75

Figures in brackets printed at the end of the 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

$$\frac{\sqrt{2}-1}{3-2\sqrt{2}}$$ [5 marks]

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(b) (i) Write $2x^2 + 8x - 3$ in the form $2\left[(x+p)^2 - q \right]$

[2 marks]

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(ii) Hence state the minimum value of $2x^2 + 8x - 3$ and the value of x at which it occurs. [2 marks]

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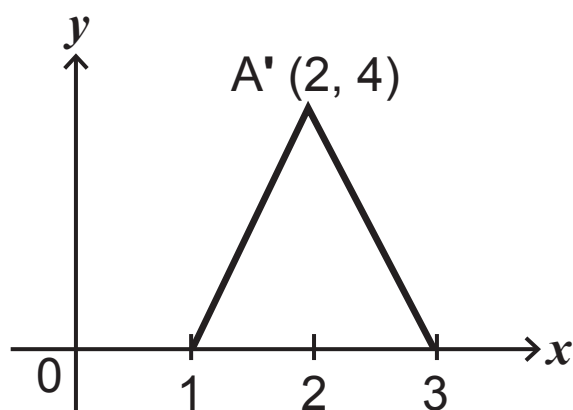**2** **Fig. 1** below shows a sketch of the graph of the function $y = f(x)$.
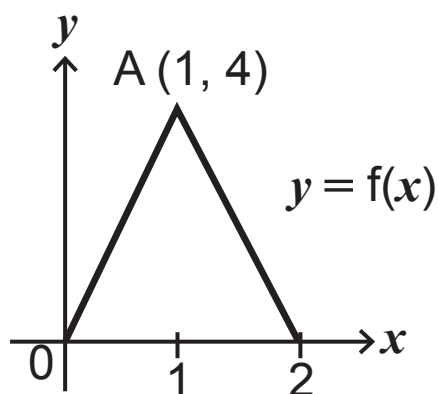
Fig. 1

Point A has coordinates (1, 4).
Each following sketch shows a single transformation of the function $y = f(x)$.

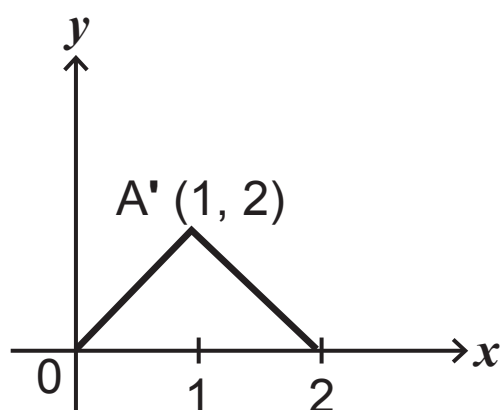For each sketch, use function notation to describe the transformation shown.   [2 marks for each]

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3 **(a)** Simplify as far as possible
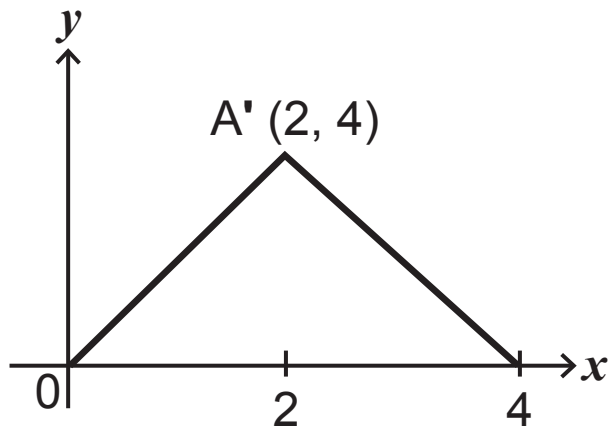
$$\left[\frac{1}{x-3} - \frac{2}{x}\right] \div \frac{x-6}{4(x-3)} \qquad \text{[5 marks]}$$

(b) Solve

$$36 \times 6^{x} = \left(\frac{1}{6}\right)^{x-3}$$ [5 marks]

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[Turn over

4 **(a)** A curve has the equation

$$y = ax^2 + bx + c$$

where a, b and c are integers.
The curve passes through the points
(1, 6), (−2, 15) and (3, 20).

By forming and solving three simultaneous equations,
find the values of a, b and c.   [7 marks]

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(b) Fig. 2 below shows a sketch of a curve and a straight line.
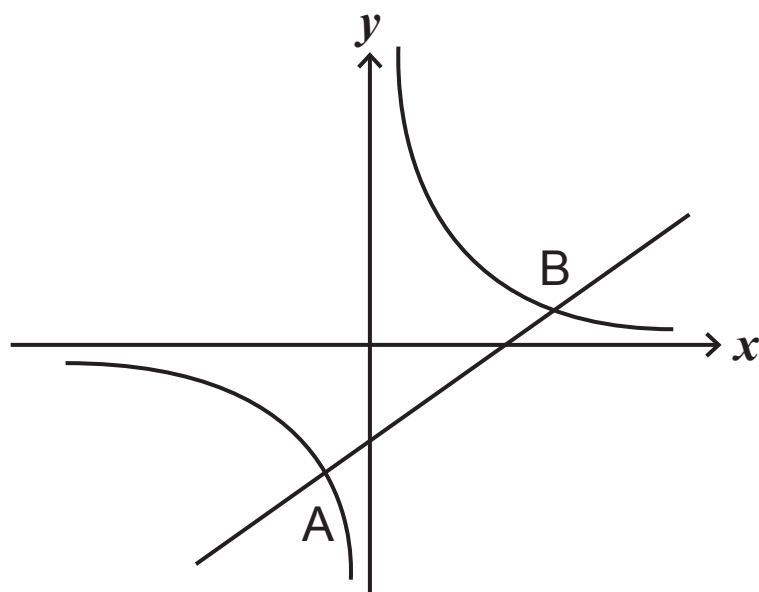
Fig. 2

The straight line has equation $y = x - 2$

The curve has equation $y = \dfrac{3}{x}$

They intersect at the points A and B.

(i) Find the coordinates of A and B.   [5 marks]

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(ii) Hence find the mid-point of the line AB.   [2 marks]

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5 A cubic function is defined as

$$f(x) = x^3 + (p - 1)x^2 - p^3$$

where p is a positive constant.
When f(x) is divided by ($x - 3$) the remainder is 18

(i) Find the value of p.   [5 marks]

(ii) Hence find the remainder when f(x) is divided
by ($2x + 1$).   [2 marks]

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[Turn over

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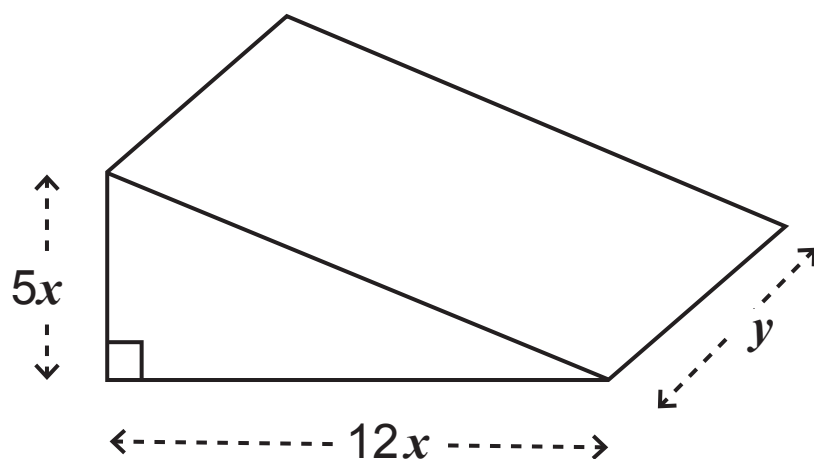
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6 **Fig. 3** below shows a sketch of a wooden doorstop.

Fig. 3

The doorstop is a right-angled triangular prism with base length $12x$ cm, perpendicular height $5x$ cm and depth y cm.

The volume of the doorstop is 480 cm^3

(i) Find an expression for y in terms of x.　　[2 marks]

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(ii) Hence show that A, the total surface area, can be expressed as

$A = 60x^2 + \dfrac{480}{x}$ [5 marks]

(iii) Given that

$$A = 60x^2 + \frac{480}{x}$$

use calculus to find the value of x for which A is a minimum.   [7 marks]

24

[Turn over

7 A curve is given by the equation

$$y = 2\sqrt{x} + \frac{1}{ax} + a$$

where a is a constant ($a \neq 0$).

(i) Find $\dfrac{dy}{dx}$.　　[3 marks]

(ii) The curve has a stationary point at $x = \dfrac{1}{4}$

Find the coordinates of this stationary point.　　[5 marks]

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8 Find the range of values of k for which the quadratic equation

$(k + 1) x^2 - kx + (k - 2) = 0$

has no real roots.   [7 marks]

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This is the end of the question paper

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