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0606/13

May/June 2012

2 hours

Additional Materials: Electronic calculator

Write your Centre number, candidate number and name on all the work you hand in.
Write in dark blue or black pen.
You may use a pencil for any diagrams or graphs.
Do not use staples, paper clips, highlighters, glue or correction fluid.
DO NOT WRITE IN ANY BARCODES.

Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place in the case of angles in degrees, unless a different level of accuracy is specified in the question.

You are reminded of the need for clear presentation in your answers.

The number of marks is given in brackets [] at the end of each question or part question.

The total number of marks for this paper is 80.

For Examiner's Use	
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Total	

This document consists of **16** printed pages.

Mathematical Formulae**1. ALGEBRA***Quadratic Equation*

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

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

Binomial Theorem

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

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

2. TRIGONOMETRY*Identities*

$$\sin^2 A + \cos^2 A = 1$$

$$\sec^2 A = 1 + \tan^2 A$$

$$\operatorname{cosec}^2 A = 1 + \cot^2 A$$

Formulae for $\triangle ABC$

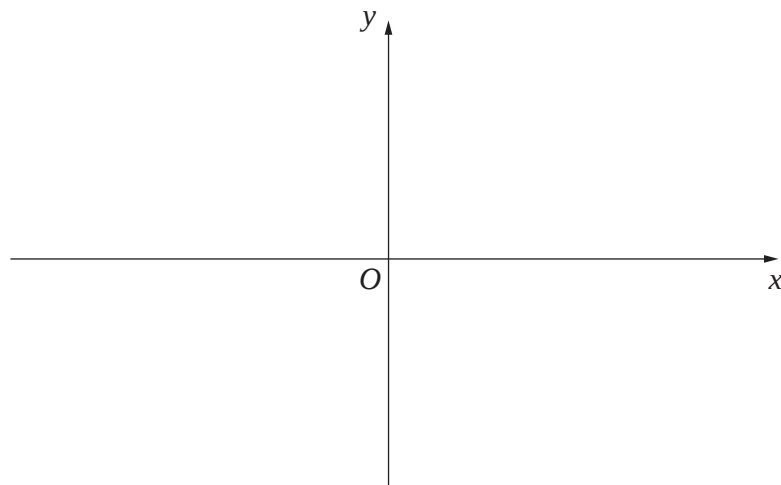
$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

$$a^2 = b^2 + c^2 - 2bc \cos A$$

$$\Delta = \frac{1}{2} bc \sin A$$

- 1 (i) Sketch the graph of $y = |2x - 5|$, showing the coordinates of the points where the graph meets the coordinate axes. [2]

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- (ii) Solve $|2x - 5| = 3$.

[2]

- 2 The expression $2x^3 + ax^2 + bx - 30$ is divisible by $x + 2$ and leaves a remainder of -35 when divided by $2x - 1$. Find the values of the constants a and b . [5]

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- 3 Find the set of values of k for which the line $y = 2x + k$ cuts the curve $y = x^2 + kx + 5$ at two distinct points. [6]

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- 4 (a) Arrangements containing 5 different letters from the word AMPLITUDE are to be made. Find

(i) the number of 5-letter arrangements if there are no restrictions, [1]

(ii) the number of 5-letter arrangements which start with the letter A and end with the letter E. [1]

- (b) Tickets for a concert are given out randomly to a class containing 20 students. No student is given more than one ticket. There are 15 tickets.

(i) Find the number of ways in which this can be done. [1]

There are 12 boys and 8 girls in the class. Find the number of different ways in which

(ii) 10 boys and 5 girls get tickets,

[3]

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Use*

(iii) all the boys get tickets.

[1]

- 5 (i) Find the equation of the tangent to the curve $y = x^3 + 2x^2 - 3x + 4$ at the point where the curve crosses the y -axis. [4]

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- (ii) Find the coordinates of the point where this tangent meets the curve again. [3]

- 6 (i) Given that $15\cos^2\theta + 2\sin^2\theta = 7$, show that $\tan^2\theta = \frac{8}{5}$.

[4]

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- (ii) Solve $15\cos^2\theta + 2\sin^2\theta = 7$ for $0 \leq \theta \leq \pi$ radians.

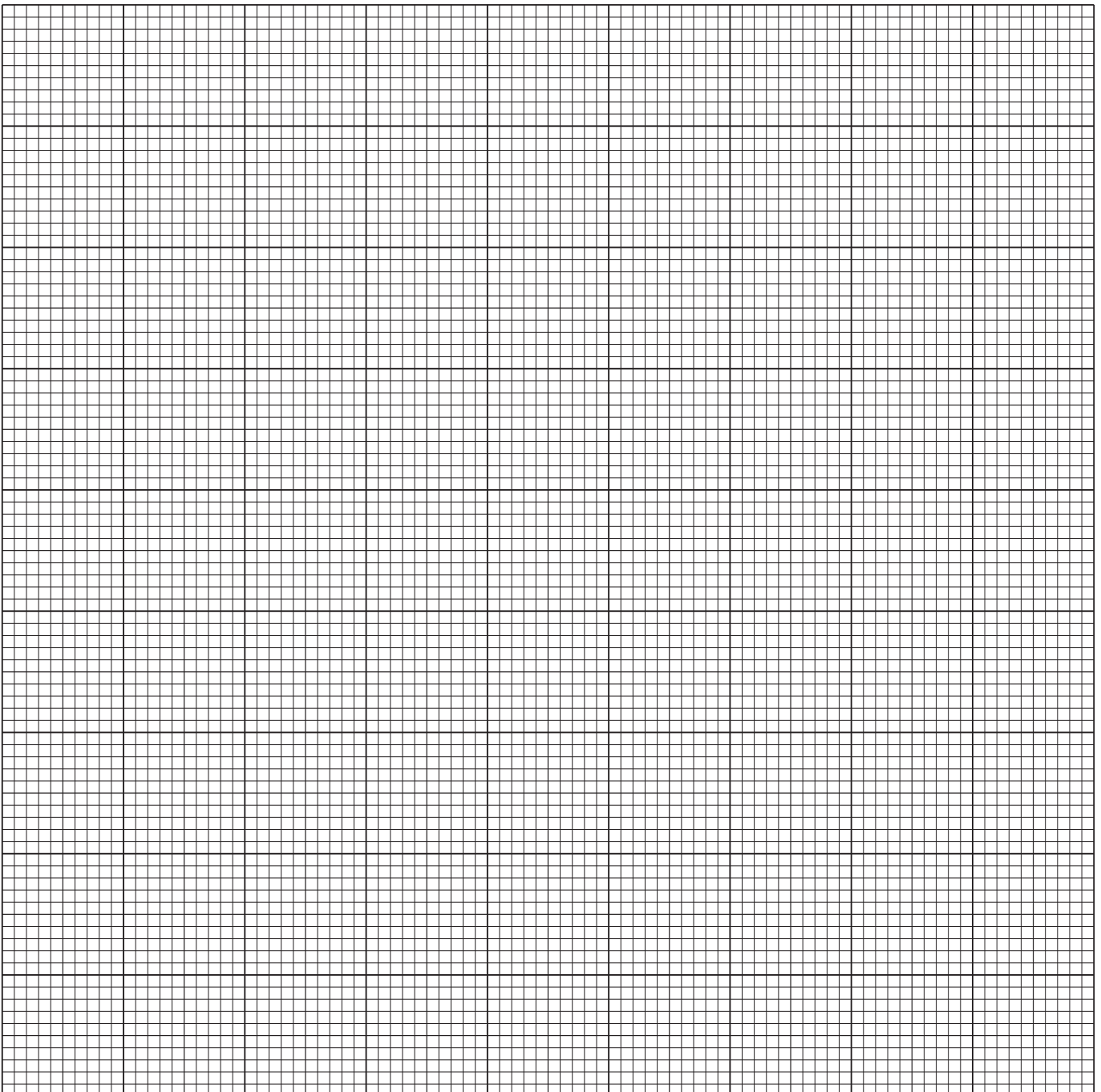
[3]

- 7 The table shows values of variables x and y .

x	1	3	6	10	14
y	2.5	4.5	0	-20	-56

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- (i) By plotting a suitable straight line graph, show that y and x are related by the equation $y = Ax + Bx^2$, where A and B are constants. [4]



- (ii) Use your graph to find the value of A and of B .

[4]

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- 8 (a) Find the value of x for which $2\lg x - \lg(5x + 60) = 1$.

[5]

- (b) Solve $\log_5 y = 4\log_y 5$.

[4]

- 9 Find the values of the positive constants p and q such that, in the binomial expansion of $(p + qx)^{10}$, the coefficient of x^5 is 252 and the coefficient of x^3 is 6 times the coefficient of x^2 . [8]

*For
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Use*

10 Variables x and y are such that $y = e^{2x} + e^{-2x}$.

(i) Find $\frac{dy}{dx}$.

[2]

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(ii) By using the substitution $u = e^{2x}$, find the value of y when $\frac{dy}{dx} = 3$.

[4]

(iii) Given that x is decreasing at the rate of 0.5 units s^{-1} , find the corresponding rate of change of y when $x = 1$.

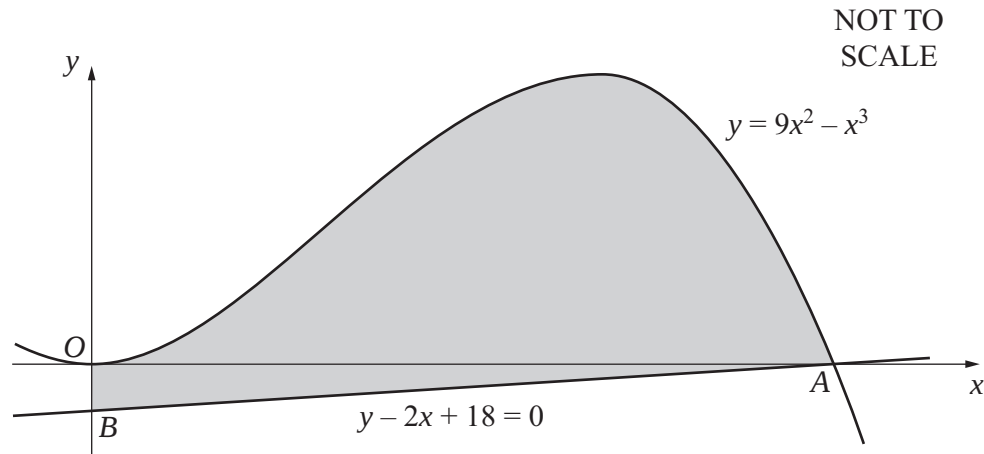
[3]

Answer only **one** of the following two alternatives.

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11 EITHER

The diagram shows part of the curve $y = 9x^2 - x^3$, which meets the x -axis at the origin O and at the point A . The line $y - 2x + 18 = 0$ passes through A and meets the y -axis at the point B .

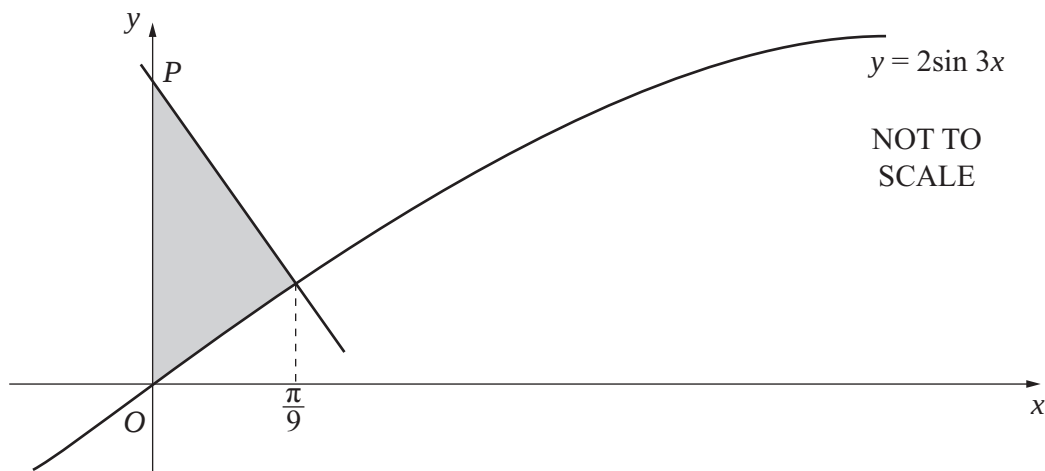


(i) Show that, for $x \geq 0$, $9x^2 - x^3 \leq 108$. [4]

(ii) Find the area of the shaded region bounded by the curve, the line AB and the y -axis. [6]

OR

The diagram shows part of the curve $y = 2\sin 3x$. The normal to the curve $y = 2\sin 3x$ at the point where $x = \frac{\pi}{9}$ meets the y -axis at the point P .



(i) Find the coordinates of P . [5]

(ii) Find the area of the shaded region bounded by the curve, the normal and the y -axis. [5]

Indicate which question you are answering.

EITHER	
OR	

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