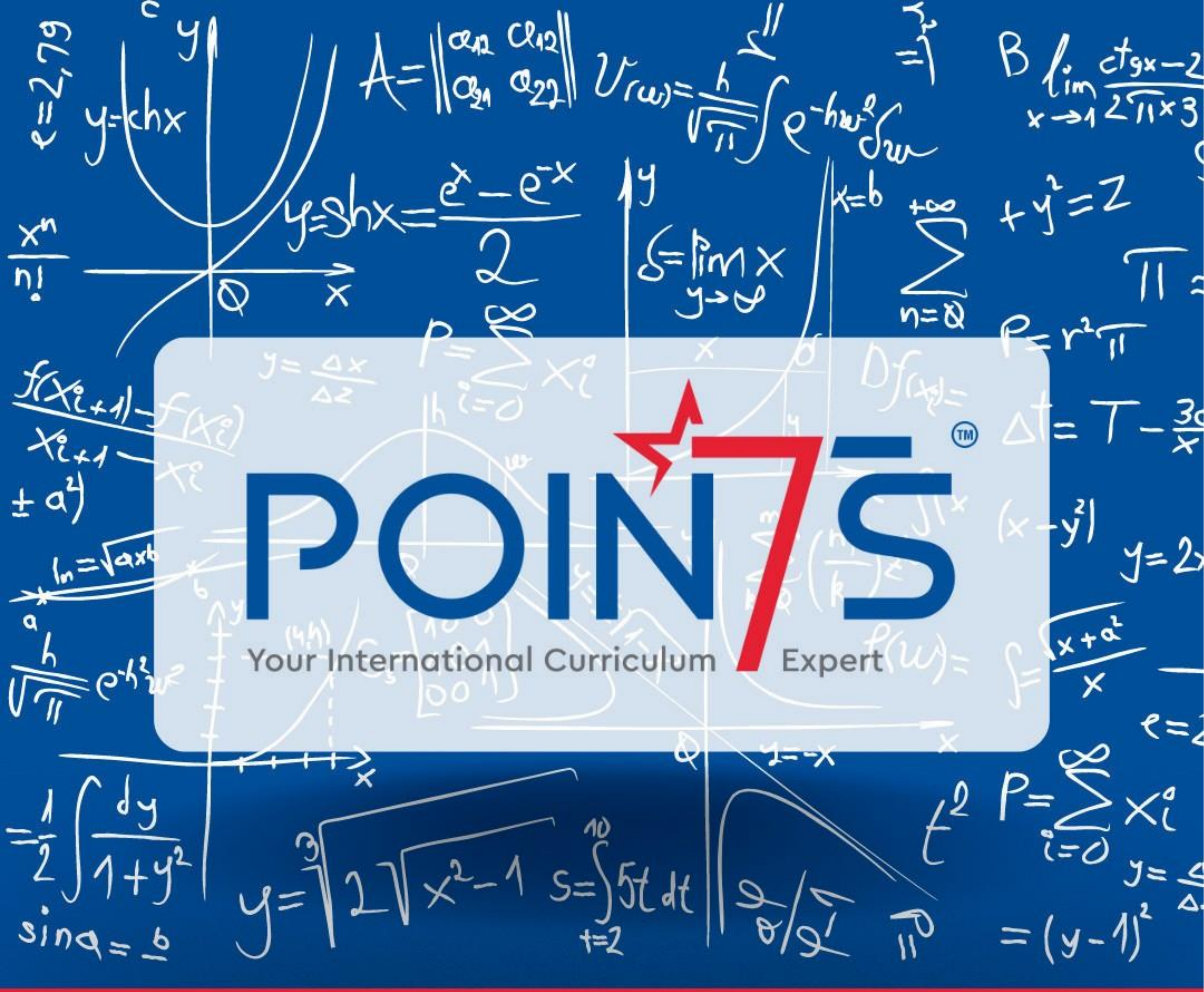

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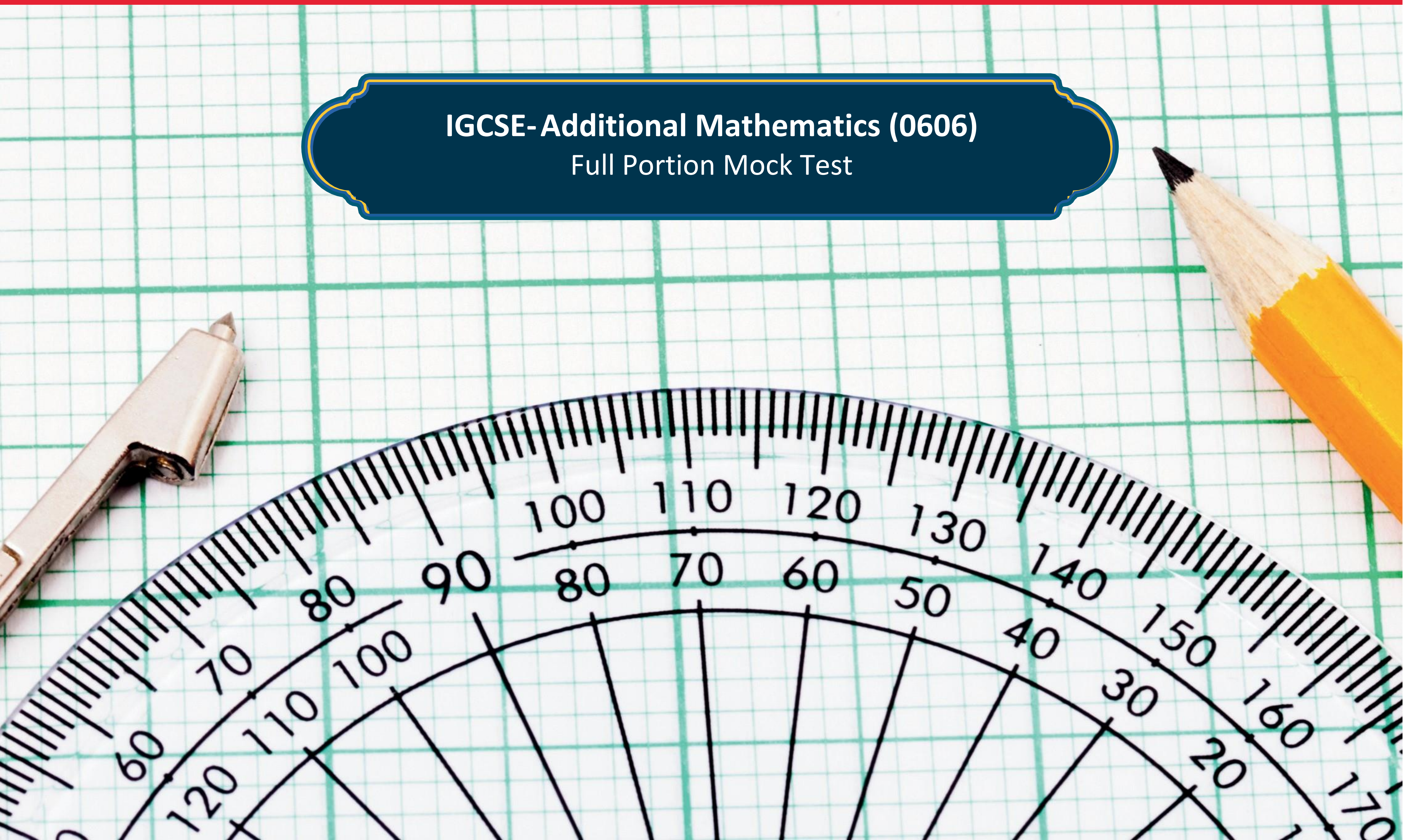
MATH TOPICAL WORKSHEETS



IGCSE- Additional Mathematics (0606)
Full Portion Mock Test

TEST PAPER

CANDIDATE NAME	

CENTRE NUMBER							CANDIDATE NUMBER				

ADDITIONAL MATHEMATICS **0606/02**

Paper 2

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.
- You should use a scientific calculator where appropriate.
- You must show all necessary working clearly.
- Give non-exact numerical answers correct to 3 significant figures, or 1 decimal place for angles in degrees, unless a different level of accuracy is specified in the question.
- For π, use either your calculator value or 3.142.

INFORMATION

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

[Turn over

1. (a) Prove the identity $\frac{\tan\theta+7}{\tan^2\theta-3} \equiv \frac{\sin\theta\cos\theta+7\cos^2\theta}{1-4\cos^2\theta}$.

[3]

(b) Hence solve the equation $\frac{\sin\theta\cos\theta+7\cos^2\theta}{1-4\cos^2\theta} = \frac{5}{\tan\theta}$ for $0^\circ \leqslant \theta \leqslant 180^\circ$.

[4]

2. (a) It is given that in the expansion of $(4 + 2x)(2 - ax)^5$, the coefficient of x^2 is -15 . Find the possible values of a.

[4]

(b) It is given instead that in the expansion of $(4 + 2x)(2 - ax)^5$, the coefficient of x^2 is k. It is also given that there is only one value of a which leads to this value of k.

Find the values of k and a.

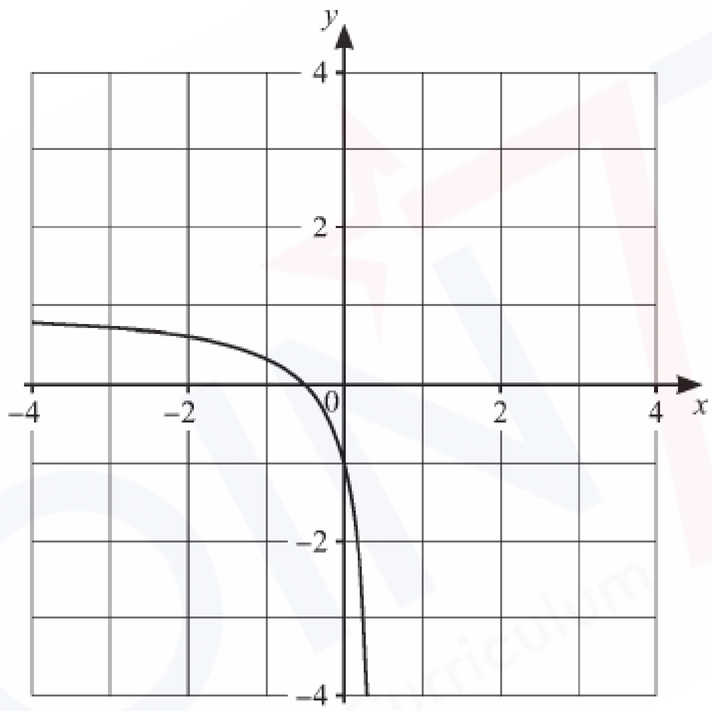
[4]

3. The function f is defined by $f(x) = \frac{2x+1}{2x-1}$ for $x < \frac{1}{2}$.

(a) (i) State the value of $f(-1)$.

[1]

(ii)



The diagram shows the graph of $y = f(x)$. Sketch the graph of $y = f^{-1}(x)$ on this diagram. Show any relevant mirror line.

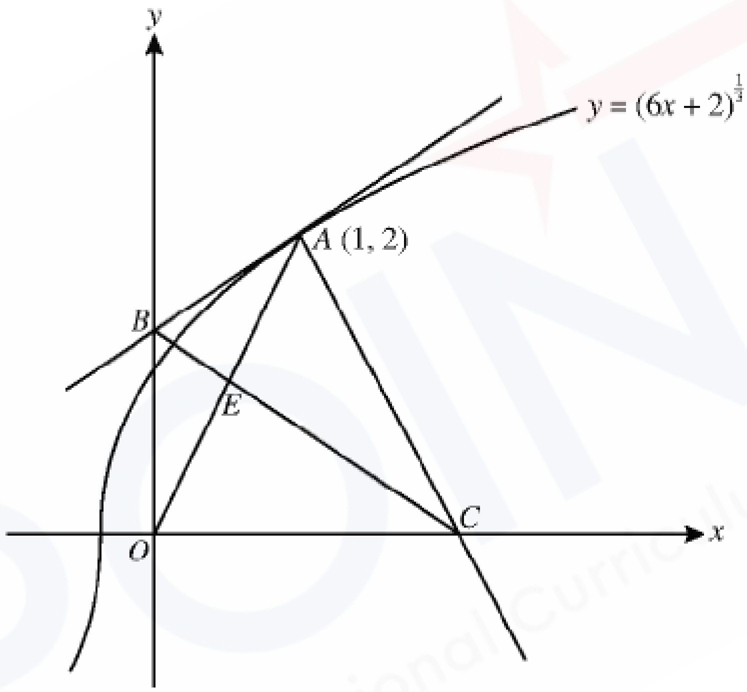
[2]

The function g is defined by $g(x) = 3x + 2$ for $x \in \mathbb{R}$.

(b) Solve the equation $f(x) = gf\left(\frac{1}{4}\right)$.

[3]

4.



The diagram shows the curve $y = (6x + 2)^{\frac{1}{3}}$ and the point $A(1,2)$ which lies on the curve. The tangent to the curve at A cuts the y-axis at B and the normal to the curve at A cuts the x-axis at C.

(i) Find the equation of the tangent AB and the equation of the normal AC.

[5]

(ii) Find the distance BC.

[3]

(iii) Find the coordinates of the point of intersection, E, of OA and BC, and determine whether E is the mid-point of OA.

[4]

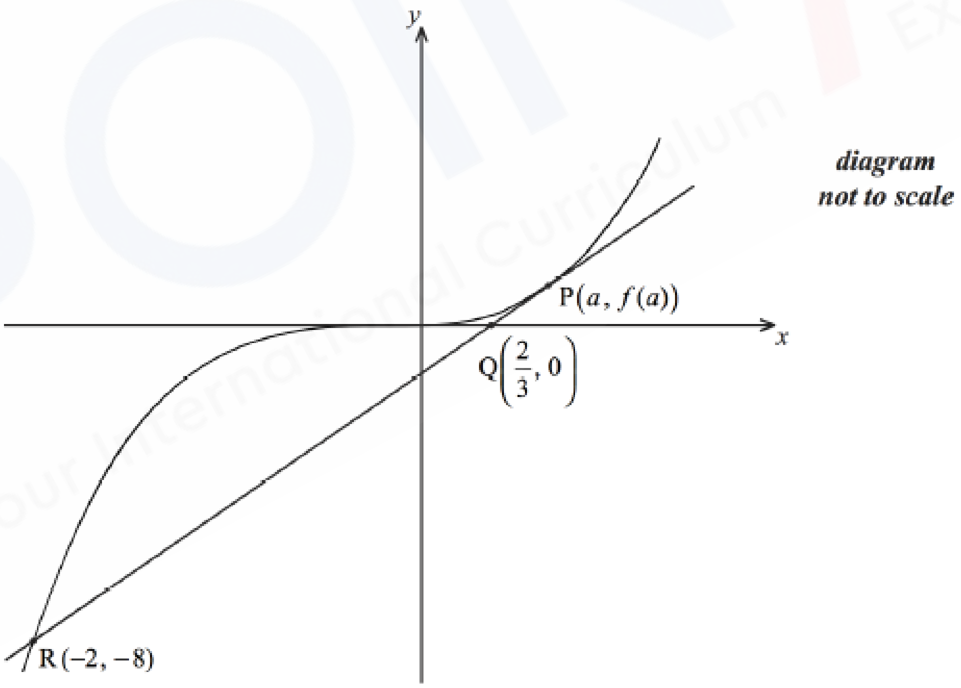
5. The line $y = 2x + 5$ intersects the circle with equation $x^2 + y^2 = 20$ at A and B.
(a) Find the coordinates of A and B in surd form and hence find the exact length of the chord AB.

[7]

A straight line through the point $(10,0)$ with gradient m is a tangent to the circle.
(b) Find the two possible values of m.

[5]

6. [Maximum mark: 16]
Let $f(x) = x^3$. The following diagram shows part of the graph of f.



The point $\mathrm{P}(a, f(a))$, where $a > 0$, lies on the graph of f. The tangent at P crosses the x-axis at the point $\mathrm{Q}\left(\frac{2}{3}, 0\right)$. This tangent intersects the graph of f at the point $\mathrm{R}(-2, -8)$.

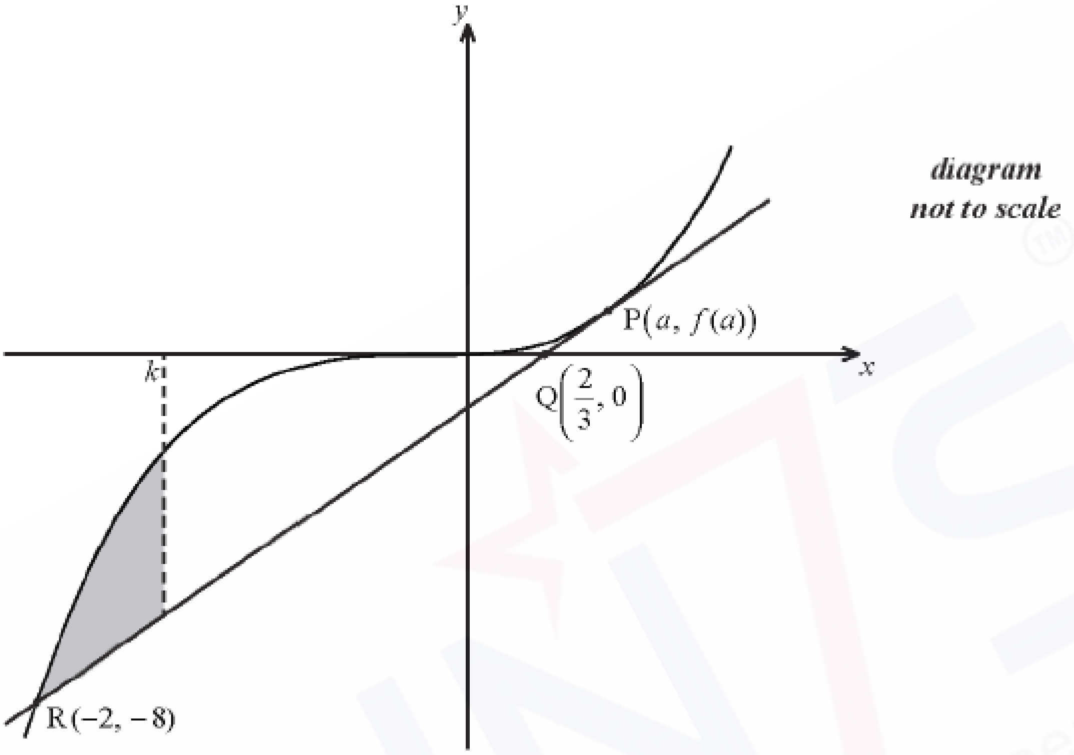
(a) (i) Show that the gradient of $[\mathrm{PQ}]$ is $\frac{a^3}{a-\frac{2}{3}}$.

(ii) Find $f'(a)$.

(iii) Hence show that $a = 1$.

[7]

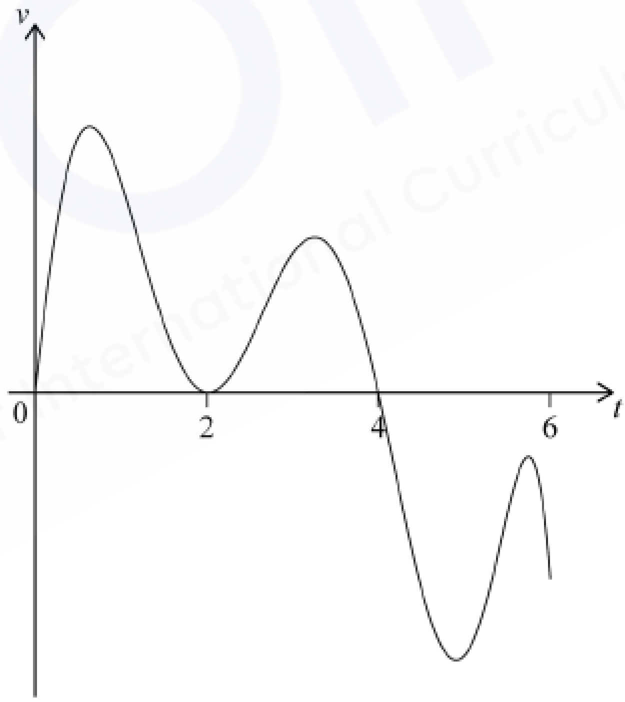
The equation of the tangent at P is $y = 3x - 2$. Let T be the region enclosed by the graph of f, the tangent [PR] and the line $x = k$, between $x = -2$ and $x = k$ where $-2 < k < 1$. This is shown in the diagram below.



(b) Given that the area of T is $2k + 4$, show that k satisfies the equation $k^4 - 6k^2 + 8 = 0$.

[9]

7. A particle P starts from point O and moves along a straight line. The graph of its velocity, v ms^{-1} after t seconds, for $0 \leq t \leq 6$, is shown in the following diagram.



The graph of v has t-intercepts when $t = 0,2$ and 4 .
The function $s(t)$ represents the displacement of P from O after t seconds.
It is known that P travels a distance of 15 metres in the first 2 seconds. It is also known that $s(2) = s(5)$ and $\int_2^4 v \, \mathrm{d}t = 9$.

(a) Find the value of $s(4) - s(2)$.

[2]

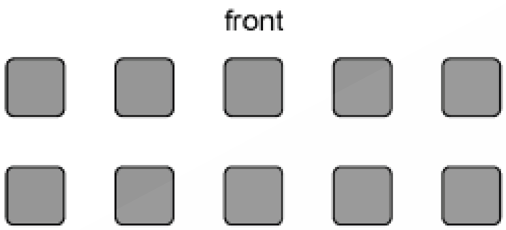
(b) Find the total distance travelled in the first 5 seconds.

[5]

8. [Maximum mark: 7]

A group of 10 children includes one pair of brothers, Alvin and Bobby, and one pair of sisters, Catalina and Daniela.

The children are to be seated at 10 desks which are arranged in two rows of five as shown in the following diagram.



Alvin and Bobby must be seated next to each other in the same row.

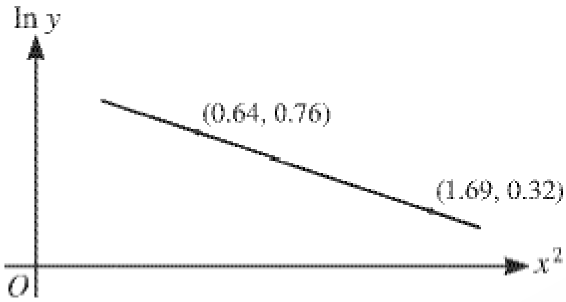
(a) Find the total number of ways the children can be seated.

[3]

After an argument, Catalina and Daniela must not be seated next to each other. Alvin and Bobby must still be seated next to each other.

(b) Find the total number of ways the children can be seated.

[4]



The variables x and y satisfy the equation $y = Ae^{-kx^2}$, where A and k are constants. The graph of $\ln y$ against x^2 is a straight line passing through the points $(0.64, 0.76)$ and $(1.69, 0.32)$, as shown in the diagram. Find the values of A and k correct to 2 decimal places.

[5]