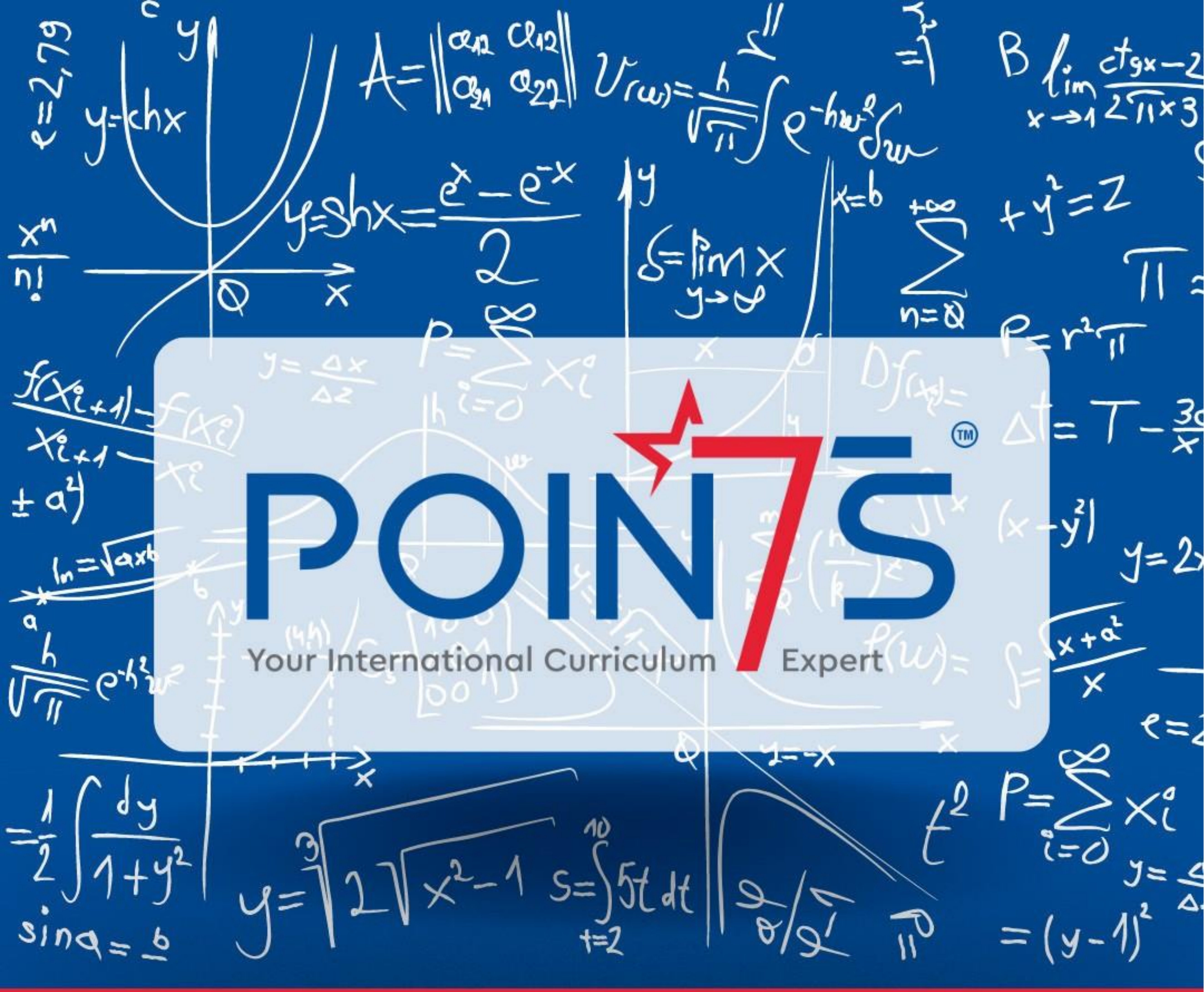

POINTS

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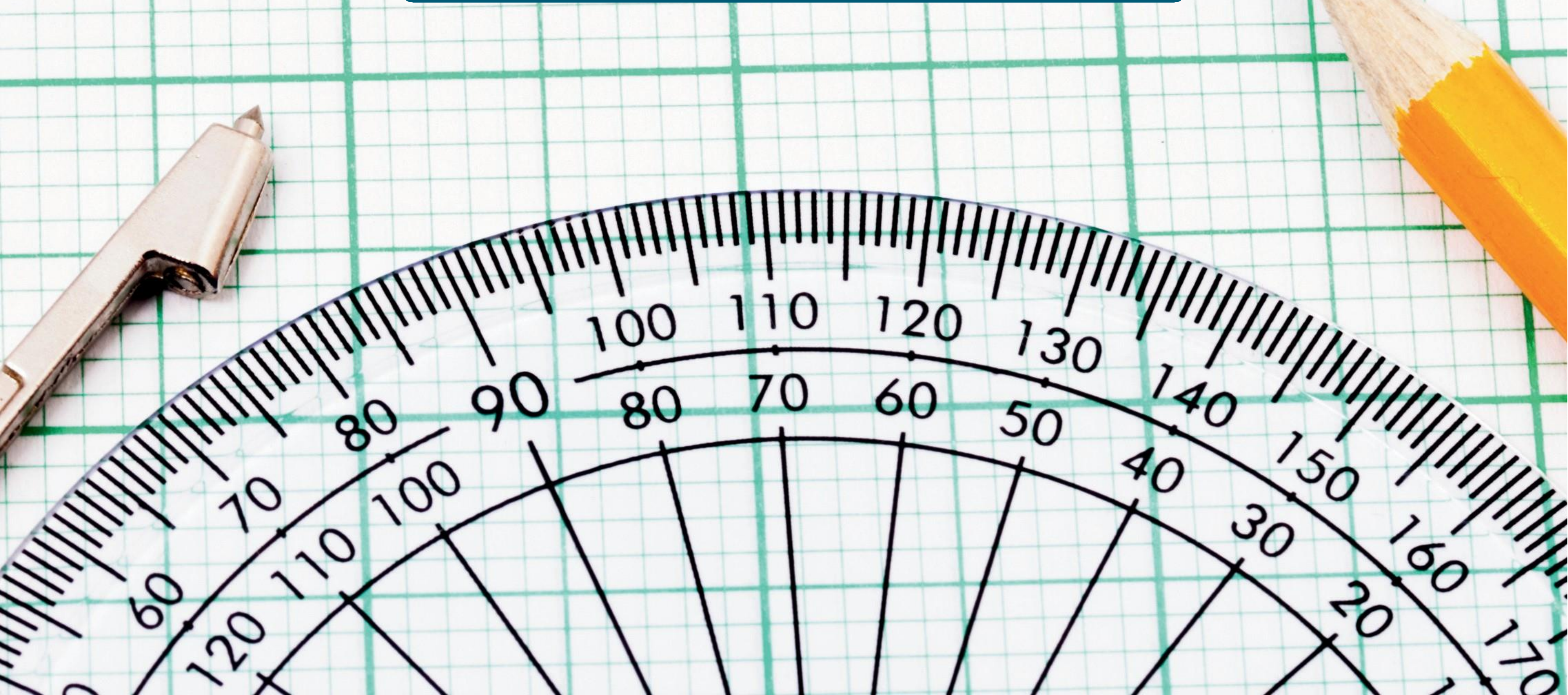
MATH TOPICAL WORKSHEETS

IGCSE-Additional Mathematics (0606)

Full Portion Mock Test



TEST-PAPER

CANDIDATE NAME

CENTRE NUMBER

CANDIDATE NUMBER

ADDITIONAL MATHEMATICS **0606/01**

Paper 1 Non-calculator

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 [ ].

[Turn over

1. The function f is defined by $f(x) = x^2 + 4ax + a$ for $x \in \mathbb{R}$, where a is a constant. The function g is such that $g^{-1}(x) = \sqrt[3]{2x - 4}$ for $x \in \mathbb{R}$.

(a) Given that the range of f is $f(x) \geqslant -33$, find the possible values of a.

[4]

(b) Given instead that $\mathrm{fgg}(0) = 96$, find the value of a.

[6]

2. The circle with equation $x^2 + y^2 - 6x + 10y - 27 = 0$ intersects the line $x = -2$ at the points P and Q. Find the area of the triangle formed by the tangents to the circle at P and Q, and the line $x = -2$.

[8]

3. An arithmetic progression has first term 5 and common difference d, where $d > 0$. The second, fifth and eleventh terms of the arithmetic progression, in that order, are the first three terms of a geometric progression.

(a) Find the value of d.

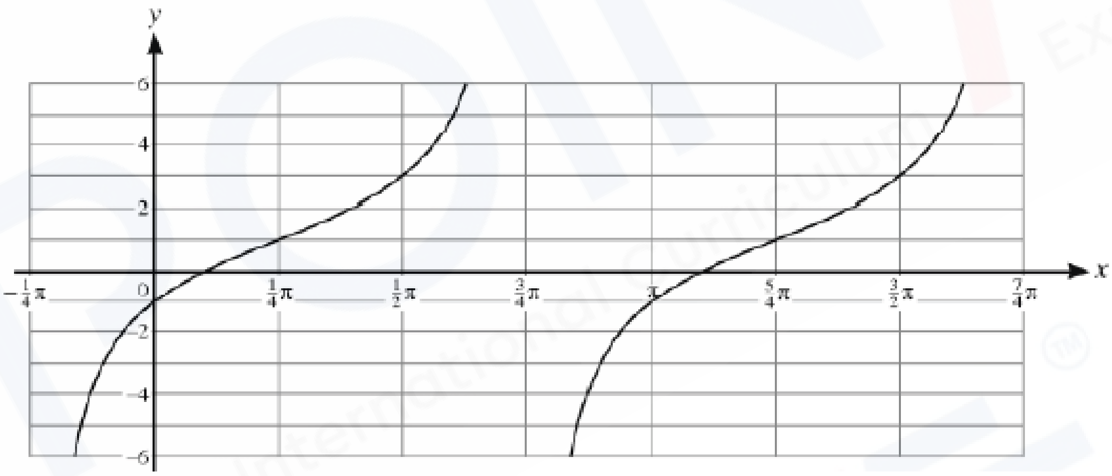
[3]

(b) The sum of the first 77 terms of the arithmetic progression is denoted by S_{77}. The sum of the first 10 terms of the geometric progression is denoted by G_{10}.

Find the value of $S_{77} - G_{10}$.

[5]

4.



The diagram shows part of the graph of $y = a\tan(x - b) + c$. Given that $0 < b < \pi$, state the values of the constants a, b and c.

[3]

5. The function f is defined by f: $x \mapsto 2x^2 - 6x + 5$ for $x \in \mathbb{R}$.

(i) Find the set of values of p for which the equation $\mathrm{f}(x) = p$ has no real roots.

[3]

The function g is defined by $g: x \mapsto 2x^2 - 6x + 5$ for $0 \leqslant x \leqslant 4$.

(ii) Express $g(x)$ in the form $a(x+b)^2 + c$, where a, b and c are constants.

[3]

(iii) Find the range of g .

[2]

The function h is defined by h : $x \mapsto 2x^2 - 6x + 5$ for $k \leqslant x \leqslant 4$, where k is a constant.

(iv) State the smallest value of k for which h has an inverse.

[1]

(v) For this value of k, find an expression for $\mathrm{h}^{-1}(x)$.

[3]

5. The equation of a curve is $y = kx^{\frac{1}{2}} - 4x^2 + 2$, where k is a constant.

(a) Find $\frac{\mathrm{d}y}{\mathrm{d}x}$ and $\frac{\mathrm{d}^2y}{\mathrm{d}x^2}$ in terms of k.

[2]

(b) It is given that $k = 2$.

Find the coordinates of the stationary point and determine its nature.

[4]

(c) Points A and B on the curve have x-coordinates 0.25 and 1 respectively. For a different value of k, the tangents to the curve at the points A and B meet at a point with x-coordinate 0.6 .

Find this value of k.

[6]

6. Solve the following equations:

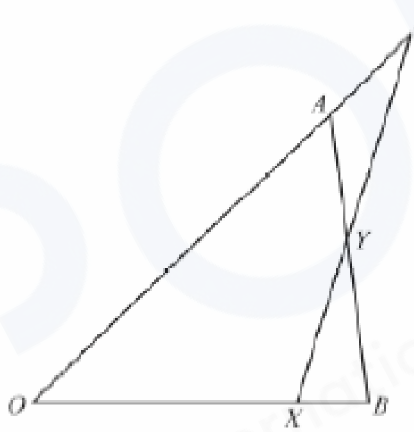
(a) $\log_2(x-2) = \log_4(x^2 - 6x + 12)$;

[3]

(b) $x^{\ln x} = \mathrm{e}^{(\ln x)^3}$.

[5]

7.



In the triangle $UAB, \overrightarrow{UA} = \mathbf{a}$ and $\overrightarrow{UB} = \mathbf{b}$. The straight line XYZ is such that:

- $\overrightarrow{OX} = \frac{4}{5}\mathbf{b}$
- $\overrightarrow{AY} = \frac{1}{3}\overrightarrow{AB}$
- $\overrightarrow{AZ} = \mu$a, where μ is a constant
- $\overrightarrow{YZ} = \lambda\overrightarrow{XY}$, where λ is a constant.

(a) Show that $\overrightarrow{XY} = \frac{2}{3}\mathbf{a} - \frac{7}{15}\mathbf{b}$.

[3]

(b) Find $\overrightarrow{YZ}$ in terms of λ, a and **b**.

[1]

(c) Find $\overrightarrow{YZ}$ in terms of μ, a and **b**.

[2]

(d) Hence find the values of λ and μ,

[3]

8. [Maximum mark: 5]

The polynomial $x^4 + px^3 + qx^2 + rx + 6$ is exactly divisible by each of $(x-1)$, $(x-2)$ and $(x-3)$.

Find the values of p, q and r.

9. [Maximum mark: 5]

Port A is defined to be the origin of a set of coordinate axes and port B is located at the point (70,30), where distances are measured in kilometres. A ship S_1 sails from port A at 10:00 in a straight line such that its position t hours after 10:00 is given by $r = t\binom{10}{20}$.
A speedboat S_2 is capable of three times the speed of S_1 and is to meet S_1 by travelling the shortest possible distance. What is the latest time that S_2 can leave port B ?