ieb assessment matters

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TOTAL MARKS

Sequence number

NATIONAL SENIOR CERTIFICATE EXAMINATION
NOVEMBER 2025

MATHEMATICS: PAPER I

EXAMINATION NUMBER

Time: 3 hours

150 marks

PLEASE READ THE FOLLOWING INSTRUCTIONS CAREFULLY

1. This question paper consists of 28 pages and an Information Sheet of 2 pages (i–ii). Please check that your question paper is complete.
2. Read the questions carefully.
3. **Answer all the questions on the question paper and hand this in at the end of the examination. Remember to write your examination number in the space provided.**
4. Write your answers in the spaces provided.
5. You may use an approved non-programmable and non-graphical calculator unless otherwise stated.
6. Clearly show **ALL** calculations, diagrams, graphs, etc. that you have used to determine your answers. **Answers only will NOT necessarily be awarded full marks.**
7. Diagrams are not necessarily drawn to scale.
8. If necessary, round off answers to **TWO** decimal places, unless otherwise stated.
9. It is in your own interest to write legibly and to present your work neatly.
10. Two blank pages (page 27 and 28) are included at the end of the paper. If you run out of space for a question, use these pages. Clearly indicate the number of your answer should you use this extra space.

FOR OFFICE USE ONLY: MARKER TO ENTER MARKS

Q1	Q2	Q3	Q4	Q5	Q6	Q7	Q8	Q9	Q10	Q11	Q12	Q13	TOTAL
14	12	18	5	11	13	13	8	16	11	8	6	15	/150

SECTION A

QUESTION 1

(a) Solve for x.

(1) $3x(x-2)(4x+7)=0$

(3)

(2) Solve for x, correct to **two decimal places**, by completing the square.

$x^2-2x-2=0$

(4)

(3) Solve for x: $x^2 - 2x - 8 < 0$ if $x \in \mathbb{Z}$.

(4)

(b) Show that equation $x^2 - 2px = -p^2$ has equal roots for all values of p.

(3)
[14]

QUESTION 2

(a) Solve for x if $2^x + 2^{x+1} = 192$. (3)

(b) Solve for x if $\sqrt{5-x} + x + 1 = 0$. (5)

(c) If $\log 2 = p$ and $\log 3 = q$, determine the value of $\log 1\frac{1}{2}$ in terms of p and q.

(2)

(d) If $\log x + \log z = \log y^2$, show that x, y and z form a geometric sequence.

(2)
[12]

QUESTION 3

(a) Given that: $f(x) = -2x^2 - 2$.

(1) Determine $\frac{f(x+h)-f(x)}{h}$, the average rate of change of f over the interval $[x; x+h]$. **Simplify your answer.**

(5)

(2) Hence, determine $\lim_{h \to 0} \frac{f(x+h)-f(x)}{h}$.

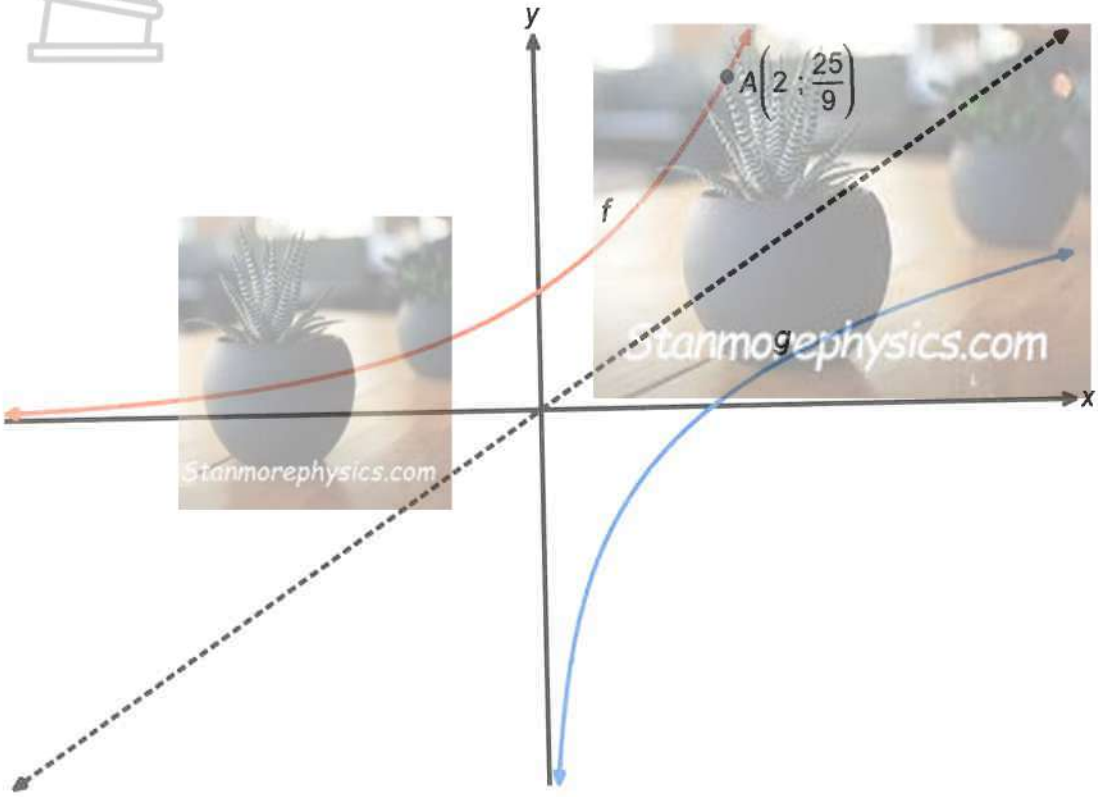
(1)

(b) Find $f'(x)$ if $f(x) = \sqrt[3]{x^2} - \frac{3}{x^5} + \pi^2$.

(4)

(c) In the diagram below:

- $f(x) = p^x$.
- $A\left(2; \frac{25}{9}\right)$ lies on the graph of f.
- f and g are symmetrical about the line $y = x$.



(1) Determine the value of p.

(2)

(2) Determine the equation of g.

(2)

(3) Write down the domain and range of f.

(2)

(4) (i) h is formed if f is moved two units to the right. Write down the equation of $h(x)$.

(1)

(ii) What is the equation of the asymptote of h?

(1)
[18]

QUESTION 4

(a) Given that: $S_n = \frac{n}{2}[2a + (n-1)d]$.

Determine a in terms of S_n, n and d.

(3)

(b) In an arithmetic series, $S_{10} = 500$ and the common difference is $\frac{100}{9}$.

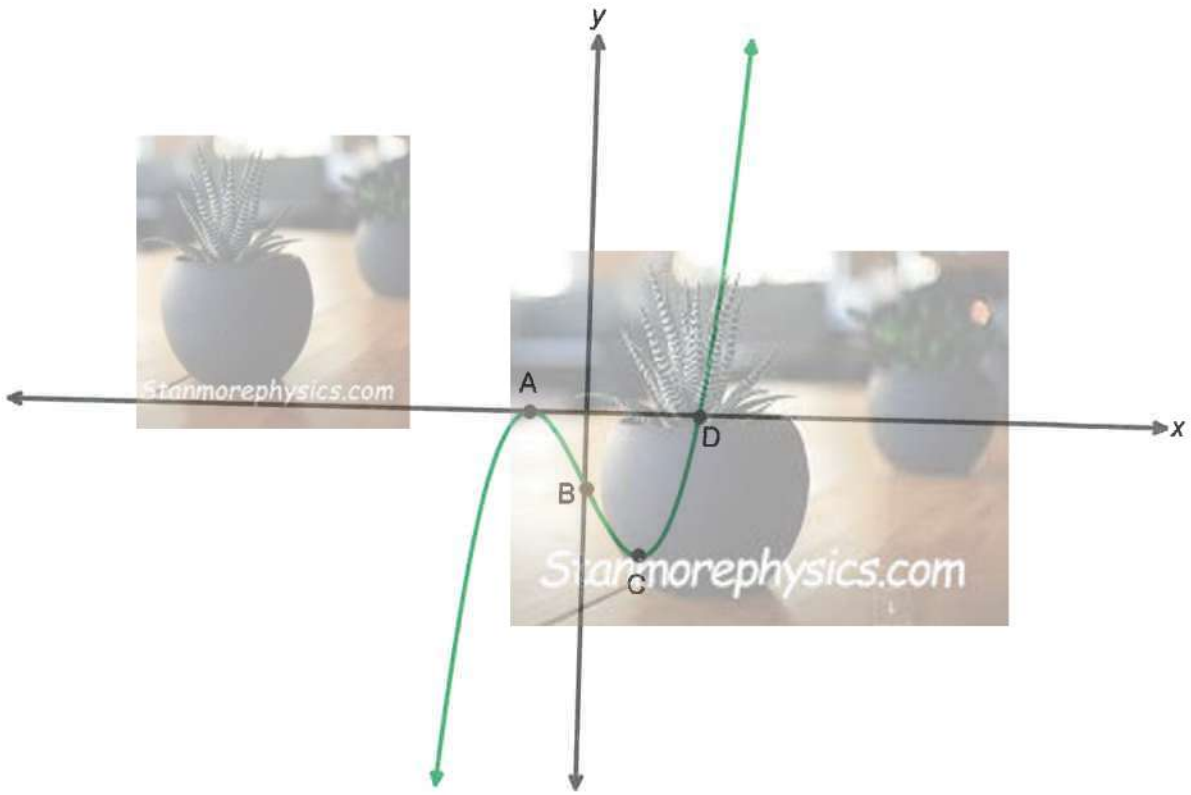
Determine the first term.

(2)
[5]

QUESTION 5

In the diagram below:

- $g(x) = x^3 - 3x - 2$.
- A and C are the turning points of g.
- A and D are the x-intercepts.
- B is the y-intercept.



(a) Determine the coordinates of B and C. (6)

(b) Find the x coordinate(s) of the point(s) where $2y - 18x = k$ is a tangent to g.

(5)
[11]

QUESTION 6

Give the correct answer rounded off to two decimal places.

(a) Tlhogi establishes a trucking company. The first truck he buys costs R750 000, and it depreciates at 25% per annum using a reducing balance method. However, due to inflation, the price of a new truck appreciates at a rate of 10% per annum.

(1) Calculate the depreciated value of the truck after 4 years.

(2)

(2) Calculate the value of a new truck in 4 years' time.

(2)

(3) Tlhogi plans to replace the original truck in 4 years, using it as a trade-in and to pay the remaining amount in cash. To save up for the required cash amount he makes equal monthly payments into a sinking fund earning interest of 8,5% per annum, compounded monthly. He makes his first payment at the end of the first month of the 4 years and his last at the end of the 4 years.

Calculate the value of each monthly instalment he pays into the sinking fund.

(5)

(b) An amount invested at x% per annum, compounded monthly, doubles in 10 years. Determine the value of x.

(4)
[13]

73 marks

SECTION B

QUESTION 7

(a) The first four terms of a quadratic number pattern are 4, 7, $x+7$ and $x+y+7$. If the fourth term is 58, determine the values of x and y.

(6)

(b) Determine $\sum_{k=0}^{50}\left((-3)^k+3k\right)$ correct to two decimal places.

Show all working.

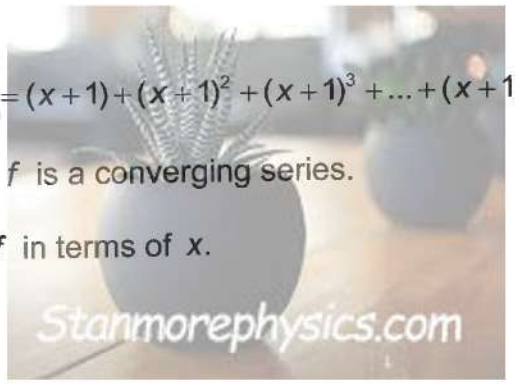
(7)
[13]

QUESTION 8

Given that: $f(x)=(x+1)+(x+1)^2+(x+1)^3+\ldots+(x+1)^k+\ldots$

If it is given that f is a converging series.

(a) Simplify f in terms of x.



(3)

(b) Determine the domain of f.

(2)

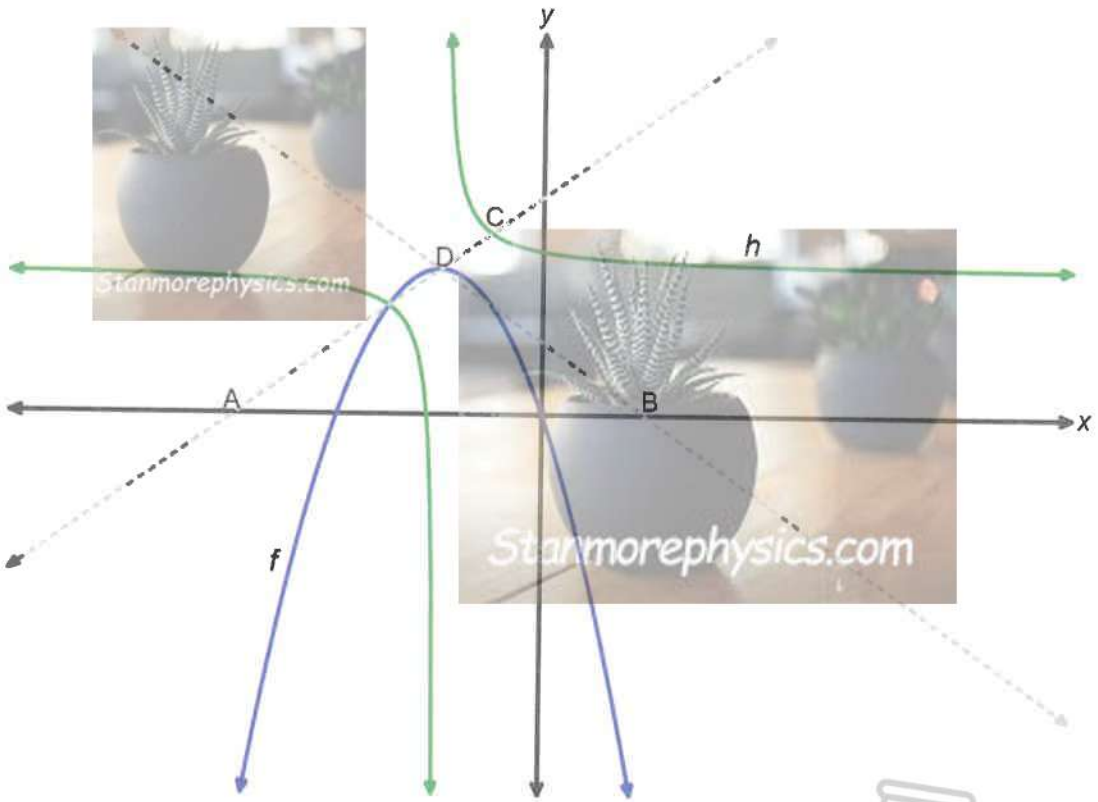
(c) Determine $f'\left(-\frac{1}{2}\right)$.

(3)
[8]

QUESTION 9

In the diagram below:

- $f(x) = a(x-m)^2 + k$ and $h(x) = \dfrac{1}{x-p} + q$.
- The equations of the axes of symmetry of h are $y = -x + 2$ and $y = x + 6$.
- D is the turning point of f and lies on both equations of the axes of symmetry of h.
- C is a point of intersection of h and the equation of the axis of symmetry of h.
- A and B are x-intercepts.
- The graph of f passes through the origin.



(a) Determine the domain of h. (3)

(b) Determine the values of a, m and k.

(4)

(c) Find the coordinates of A and B.

(3)

(d) Determine the area of ΔABC.

(6)
[16]

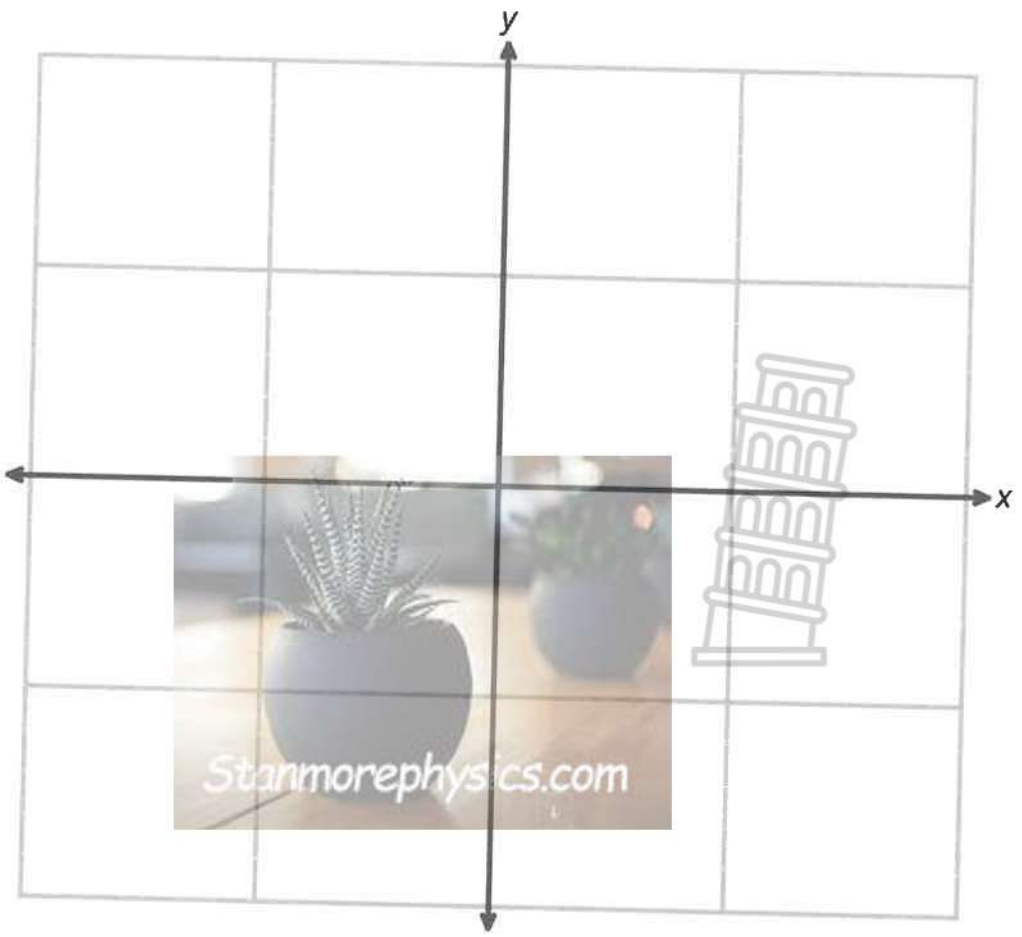
QUESTION 10

(a) If $g(x) = -a^{-x} + k$ then:

(1) Determine the coordinates of the x-intercept of the graph of g in terms of a and k.

(3)

(2) Sketch the graph of $y = g(x)$ if $0 < a < 1$ and $k > 2$.



(3)

(b) Given that: $f = \{(-1;2);(2;-1);(4;7);(-3;1);(5;6)\}$

(1) Is f a function? Explain.

(2)

(2) Give the domain of f^{-1}.

(1)

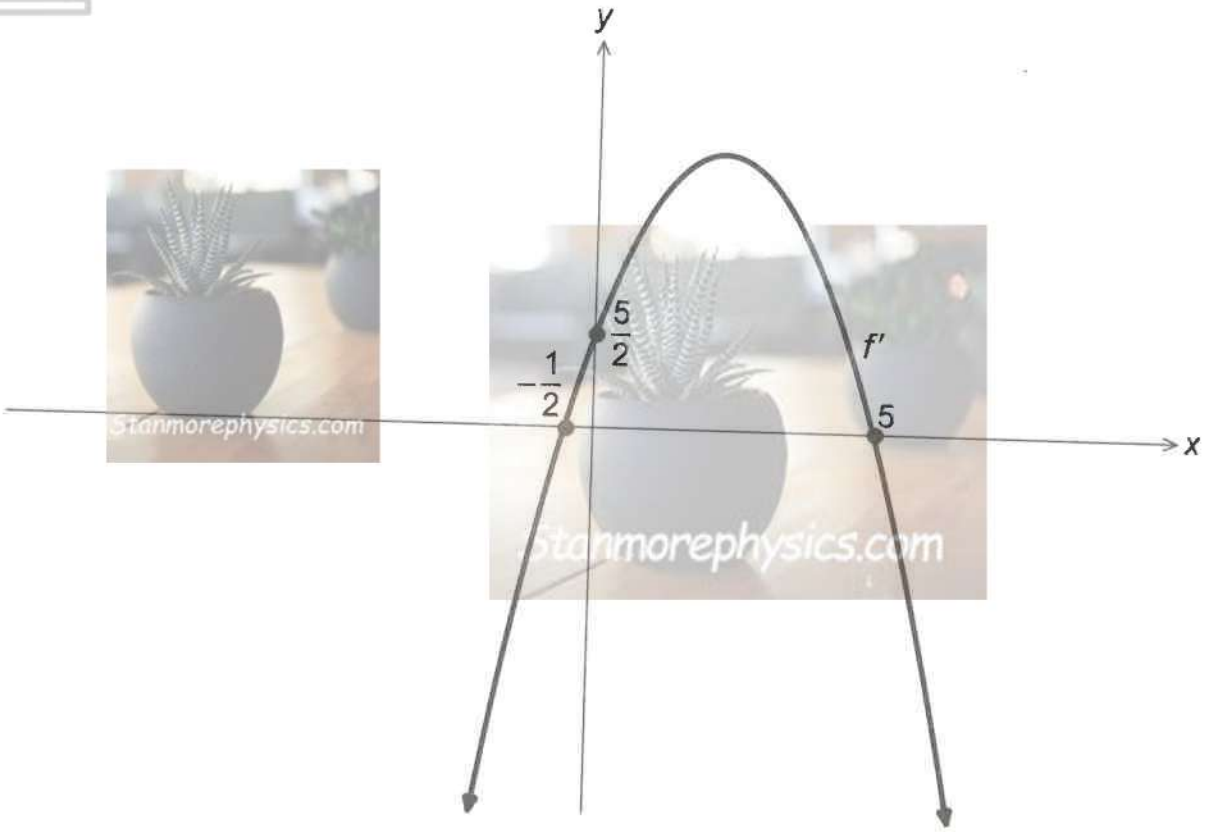
(3) Determine p if $f[f^{-1}(2)] = p$.

(2)
[11]

QUESTION 11

In the diagram below, the graph of $y = f'(x)$ the derivative of $y = f(x)$ is drawn.

- $x = -\frac{1}{2}$ and $x = 5$ are x-intercepts of f'.
- $y = \frac{5}{2}$ is the y-intercept of f'.

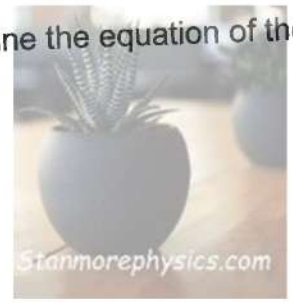


(a) Determine the values of x for which f is increasing. (2)

(b) Determine the value of x for which $f''(x) = 0$.

(1)

(c) Determine the equation of the tangent to the curve f at the point $(0; 9)$.



(2)

(d) For which values(s) of x is $\frac{f'(x)}{2x} \leq 0$?

(3)
[8]

QUESTION 12

A local food packaging company in South Africa produces canned food in the shape of cylinders, each with a fixed volume of $150\pi\ cm^3$. To reduce production costs, the company aims to minimise the total surface area of each can.

Given that r represents the radius and h the can's height, determine the radius, which will result in minimum surface area.

Useful formulae:

$S = 2\pi r^2 + 2\pi rh$

$V = \pi r^2 h$

[6]

QUESTION 13

(a) In a group of 21 learners, the following is true:

- 11 have taken History
- 6 have taken History but not Geography

(1) Determine the number of students who have taken History and Geography.

(1)

(2) Determine the maximum number of students who have taken Geography but not History.

(2)

(3) If 7 students take Geography, are the events 'Taking History as a Subject' and 'Taking Geography as a Subject' independent or not?

(3)

(b) A password uses two letters of the alphabet, followed by four digits from 0 to 9, where repetition of letters and digits is allowed. What is the probability that the code starts with a vowel and ends with an even digit greater than 4?

(4)

(c) Given that: A and B are two events in a sample space, S.

- $n(S) = 10$ and $n(A) = 9$.
- $P(B') = 0,2$

Masego argues that the probability of A and B is at least 70%. Do you agree with this claim? **Justify your answer with reasoning and calculations.**

(5)
[15]

77 marks

Total: 150 marks