education

MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

Stanmorephysics.com

MATHEMATICS P1

SEPTEMBER 2025

Stanmorephysics.com

MARKS: 150

TIME: 3 HOURS

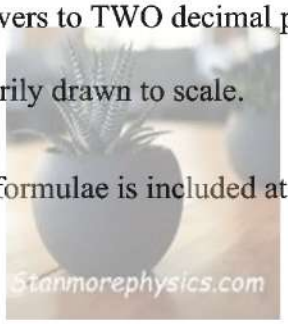
This question paper consists of 10 pages, 1 formula sheet and a 22-page SPECIAL ANSWER BOOK.

Copyright reserved

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. The question paper consists of 10 questions.
2. Answer ALL the questions on the SPECIAL ASNWER BOOK provided.
3. Clearly show ALL calculations, diagrams, graphs, etc. which you have used in determining the answers.
4. Answers only will NOT necessarily be awarded full marks.
5. You may use an approved scientific calculator (non-programmable and non-graphical) unless stated otherwise.
6. If necessary, round off answers to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. An information sheet with formulae is included at the end of the question paper.
9. Write neatly and legibly.



Copyright reserved

QUESTION 1

1.1 Solve for x if:

1.1.1 $6x^2 - 2x = 0$ (2)

1.1.2 $2x^2 = 1 - 4x$ (3)

1.1.3 $\sqrt{x-2} + 4 = x$ (4)

1.1.4 $3^{4x} - 8.3^{2x} - 9 = 0$ (3)

1.1.5 $-x^2 - x + 12 < 0$ (4)

1.2 Solve for x and y simultaneously:

$x - y = 3$ *and* $x^2 - xy - 2y^2 = 10$ (6)

1.3 Given: $(a+b)(a-b) = 2b(8a-b)$, $a > 0$, $b > 0$
Determine: $(a+b)^2$ in terms of ab. (4)

[26]

QUESTION 2

2.1 Given the arithmetic pattern: 181 ; … ; 9 ; 5 ; 1.

2.1.1 Determine the n^{th} term of the sequence. (2)

2.1.2 Calculate the number of terms in the sequence. (2)

2.1.3 Calculate the sum of the series 181 + … + 17 + 13. (3)

2.1.4 Write the series in 2.1.3 in sigma-notation. (2)

2.2 The general term of a quadratic sequence is $T_n = an^2 - 5n + c$
It is given that $T_4 = 18$ and $T_3 = T_2 + 5$.
Calculate the values of a and c. (5)

[14]

Copyright reserved

QUESTION 3

3.1 A computer tablet is infected with a malware programme (computer-generated virus). It has resulted in its flat rectangular screen being affected by $\frac{1}{4}$ of the screen being blocked on the first day. On each successive day it blocks a further portion of the screen, as big as $\frac{1}{4}$ of the area it blocked on the previous day. The malware programme continues to act indefinitely.
Before the infection, the area of the screen was 800 square units.

3.1.1 Determine the total area blocked at the end of four days (**do not round off your answer).** (3)

3.1.2 If the malware programme continues to act indefinitely, what fraction of the user's screen will eventually be blocked out? (2)

3.2 The sum of the first n terms of a geometric series $9 + 6 + 4 + \ldots$ is greater than 25. Calculate the smallest value of n that will give a sum greater than 25. (6)

[11]

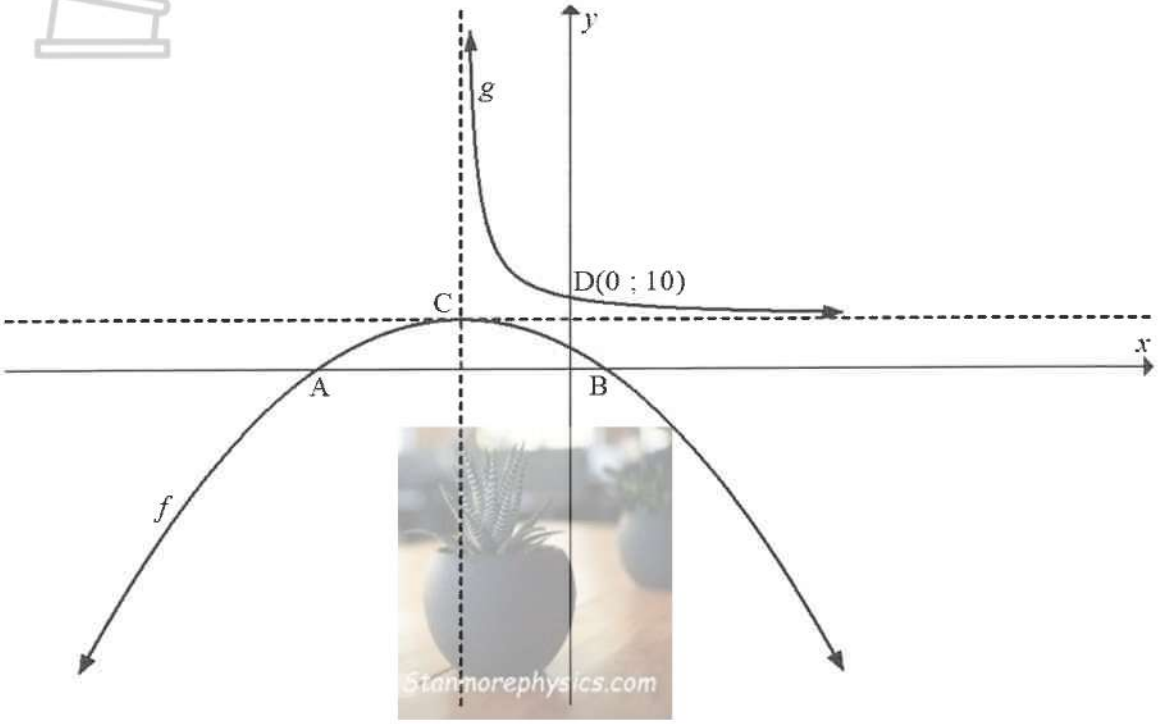


Copyright reserved

QUESTION 4

The sketch below shows the graphs of $f(x) = -x^2 - 4x + 3$ and $g(x) = \frac{a}{x-p} + q,\ x > p$.

A and B are x-intercepts of f. C is the turning point of f.
D(0 ;10) is the y-intercept of g.



4.1 Determine the length of AB **to the nearest two decimal places.** (4)

4.2 Determine the coordinates of C. (3)

4.3 Find the equation of g if the asymptotes of g intersects at the turning point of f. (4)

4.4 Determine the values of x for which $f'(x) > 0$. (2)

4.5 Describe the transformation from f to h if $h(x) = x^2 + 4x - 15$. (2)

4.6 Determine the values of x for which $\frac{g(x)}{f(x)} \geq 0$. (2)

[17]

Copyright reserved

QUESTION 5

5.1 Consider the following function: $f(x) = \log_{\frac{4}{3}} x$

5.1.1 Write down the coordinates of the x-intercept of f. (1)

5.1.2 Determine the equation of the inverse of f in the form $f^{-1}(x) = ...$ (2)

5.1.3 Sketch the graphs of f and f^{-1} on the same set of axes. Clearly indicate which one is f and f^{-1}, as well as the intercepts with the axes and asymptotes.
Also sketch the axis of symmetry of f and f^{-1} AND write its equation. (5)

5.1.4 If A $(e\,;-2)$ is a point on f, calculate the value of e. (2)

5.1.5 Write down the domain of f. (1)

5.2 Given: $p(x) = \left(\frac{2}{3}\right)^x - 1$

5.2.1 Give the equation of t if $t(x)$ is the reflection of p in the y-axis. (2)

5.2.2 Write down the range of p. (1)
[14]

Stanmorephysics.com

QUESTION 6

6.1 A machinery costing R27 000 depreciated at a rate of 13,71% p.a. Calculate the scrap value of the machinery after 7 years, on the reducing balance method. (2)

6.2 A loan of R800 000 is taken out at an interest rate of 13% p.a. compounded bi-annually. It is repaid by equal bi-annual payments of R57 000 and a final payment less than R57 000.

6.2.1 How many payments are required to settle the loan? (5)

6.2.2 What is the outstanding balance on the loan after the final payment of R57 000? (2)

6.2.3 What is the value of the final payment? (1)

6.3 A company sold shares at a fixed price of R765,50 per share over 4 years.
A minimum guaranteed interest rate earned over the 4-year period is 7,4% per annum compounded quarterly.
Charlene purchased 10 shares every quarter over the 4-year period. Her first purchase was at the beginning of the first quarter of the 4-year period, and then at the end of each quarter.

6.3.1 Calculate the minimum value of her investment at the end of the 4-year period. (4)

6.3.2 Calculate the percentage profit she made at the end of the 4-year period. (3)
[17]

QUESTION 7

7.1 Given: $f(x)=-\frac{4}{x}$ (4)

Determine $f'(x)$ from FIRST PRINCIPLES.

7.2 Determine:

7.2.1 $f'(x)$ if $f(x)=-\frac{5}{x^2}+(4x-1)\pi$ (3)

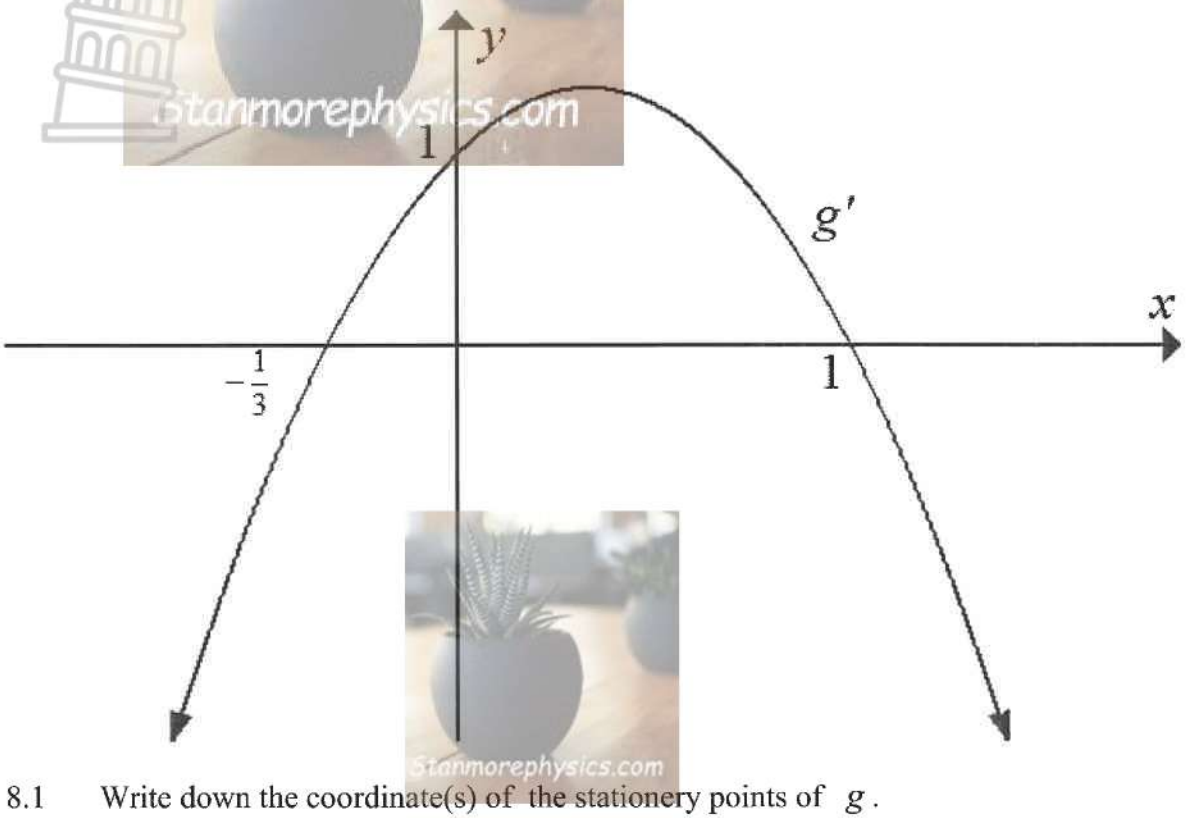
7.2.2 $D_x\left[\frac{\sqrt[4]{x^3}-2x^5}{x}\right]$ (4)

7.2.3 $\frac{dy}{dx}$ if $y=(x^2-x-6)(x-3)^{-1}$ (2)
[13]

Copyright reserved

QUESTION 8

The diagram below shows the graph of $y = g'(x)$ where $g(x) = ax^3 + bx^2 + cx + d$. The graph of $g'(x)$ cuts the y-axis at $(0\,;1)$ and the x-axis at $\left(-\frac{1}{3}\,;0\right)$ and $(1;0)$.



8.1 Write down the coordinate(s) of the stationery points of g. (2)

8.2 Determine the x-coordinate of the point of inflection of g. (2)

8.3 Determine the values of x for which the function of g is increasing. (2)

8.4 Determine the equation of g' in the form $g'(x) = px^2 + qx + r$. (4)

8.5 Given that :

- $g(x) + 1$ passes through point $(0;0)$
- $g'(x) = -3x^2 + 2x + 1$

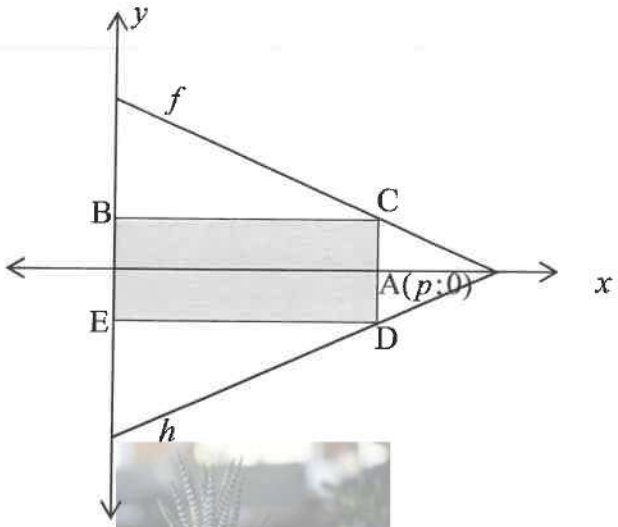
Show that for $g(x), a = -1, b = 1, c = 1$ *and* $d = -1$. (5)

[15]

Copyright reserved

QUESTION 9

The rectangle below extends from the origin to point $A(p;0)$. It touches the graph of $f(x)=-4x+8$ at point C and the graph of $h(x)=4x-8$ at point D.



9.1 Show that the area of the shaded rectangle can be expressed as $A(p)=-8p^2+16p$. (3)

9.2 Determine the maximum area of the shaded region. (5)

[8]

Copyright reserved

QUESTION 10

10.1 For two events, A and B, in the sample space S, it is given that P(A) = 0,45 ; P(B) = 0,7 and P(A and B) = 0,25.

10.1.1 Draw a Venn-diagram to represent the information. (3)

10.1.2 Determine P(A′ and B). (1)

10.1.3 Determine (A′ or B). (1)

10.1.4 Are events A and B independent? Motivate your answer with the necessary calculations. (3)

10.2 Nine coins are arranged in a row.

- Four are R1 coins
- Three are R2 coins
- Two are R5 coins

10.2.1 How many different arrangements are possible, if all the coins of the same value are identical? (3)

10.2.2 How many different arrangements are possible, if the arrangement must start and end with a R2 coin? (3)

10.2.3 What is the probability that an arrangement will start and end with a R2 coin? (1)

[15]

TOTAL MARKS: 150

Copyright reserved

INFORMATION SHEET

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

$$A = P(1 + in) \qquad A = P(1 - in) \qquad A = P(1 - i)^n \qquad A = P(1 + i)^n$$

$$T_n = a + (n-1)d \qquad S_n = \frac{n}{2}[2a + (n-1)d]$$

$$T_n = ar^{n-1} \qquad S_n = \frac{a(r^n - 1)}{r - 1};\ r \neq 1 \qquad S_\infty = \frac{a}{1 - r};\ -1 < r < 1$$

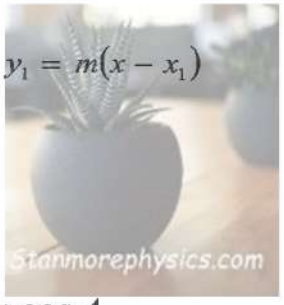
$$F = \frac{x[(1+i)^n - 1]}{i} \qquad P = \frac{x[1 - (1+i)^{-n}]}{i}$$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \qquad M\left(\frac{x_1 + x_2}{2};\ \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c \qquad y - y_1 = m(x - x_1) \qquad m = \frac{y_2 - y_1}{x_2 - x_1} \qquad m = \tan\theta$$

$$(x-a)^2 + (y-b)^2 = r^2$$



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

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

$$\text{Area of } \Delta ABC = \frac{1}{2}ab.\sin C$$

$$\sin(\alpha + \beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta \qquad \sin(\alpha - \beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta$$

$$\cos(\alpha + \beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta \qquad \cos(\alpha - \beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$$

$$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases} \qquad \sin 2\alpha = 2\sin\alpha.\cos\alpha$$

$$\bar{x} = \frac{\sum fx}{n} \qquad \sigma^2 = \frac{\sum_{i=1}^{n}(x_1 - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)} \qquad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\hat{y} = a + bx \qquad b = \frac{\sum(x - \bar{x})(y - \bar{y})}{\sum(x - \bar{x})^2}$$

Copyright reserved