Hillcrest High School

Grade 11

MATHEMATICS P1
NOVEMBER 2025

MARKS : 150
DURATION : 3 HOURS

EXAMINER : MR LS MBUYAZI

MODERATOR : MRS L JANSSENS

This question paper consists of 9 pages.

INFORMATION AND INSTRUCTIONS:

Read the following instructions carefully before answering the questions.

1. This question paper consists of **9** questions.
2. Answer ALL the questions.
3. Number the questions correctly according to the numbering system used in this question paper.
4. Clearly show ALL calculations, diagrams, graphs, etc. that you have used in determining your answers.
5. Answers only will NOT necessarily be awarded full marks.
6. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
7. If necessary, round off answers correct to TWO decimal places, unless stated otherwise.
8. Diagrams are not necessarily drawn to scale.
9. Write neatly and legibly.

QUESTION 1

1.1 Solve for x:

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

1.1.2 $x^2 = 5x+5$ (correct to TWO decimal places) (4)

1.1.3 $3^{2x}+3^x-12=0$ (3)

1.1.4 $4 \leq x(2x-7)$ (4)

1.1.5 $\sqrt{5x-1}-1=x$ (5)

1.2 Solve for *x* and y simultaneously:

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

1.3 Calculate a and b if $\sqrt{\frac{7^{2014}-7^{2012}}{12}} = a(7^b)$ and a is not a multiple of 7. (4)

[28]

QUESTION 2

2.1 Simplify the following **without using a calculator**:

2.1.1 $\frac{9}{\sqrt{48}-\sqrt{3}}$ (3)

2.1.2 $\frac{6^{x+1}.9^{x-1}}{2^{x+1}.27^x}$ (4)

2.1.3 $\sqrt{8x^2}-4\sqrt{72x^2}+5\sqrt{98x^2}$ (4)

2.2 The roots of a quadratic equation are given by $x = \frac{-5 \pm \sqrt{20+8k}}{6}$,

where $k \in \{-3;-2;-1;0;1;2;3\}$

2.2.1 Write down TWO values of k for which the roots will be rational. (2)

2.2.2 Write down ONE value of k for which the roots will be non-real. (1)

2.3 Determine the numerical value(s) of p so that the equation $x^2 - 3x + 9p = 5$ will have equal real roots. (4)

[18]

QUESTION 3

3.1 Consider the linear pattern: $25\ ;\ 21\ ;\ 17\ ;\ldots\ldots\ldots\ldots;-191$

3.1.1 Determine the general term of the pattern. (2)

3.1.2 How many terms are there in the pattern? (3)

3.2 The sequence: $3\ ;\ 9\ ;\ 17\ ;\ 27\ ;$ ... is a quadratic sequence.

3.2.1 Write down the next TWO terms. (2)

3.2.2 Determine an expression for the n^{th} term of the sequence. (4)

3.2.3 What is the value of the first term of the sequence that is greater than 269? (4)

3.3 A quadratic pattern has a second difference of -4, $T_4 = -43$ and $T_{11} = -281$.

Determine the formula for the general term. (6)

[21]

QUESTION 4

Given: $f(x) = \frac{3}{x-1} - 2$ and $g(x) = 2x - 5$

4.1 Write down the equations of the asymptotes of f. (2)

4.2 Calculate:

4.2.1 the y −intercept of f. (2)

4.2.2 the x −intercept of f. (3)

4.3 Sketch the graph of f and g on the same set of axes. Clearly showing asymptotes and ALL the intercepts with the axes. (6)

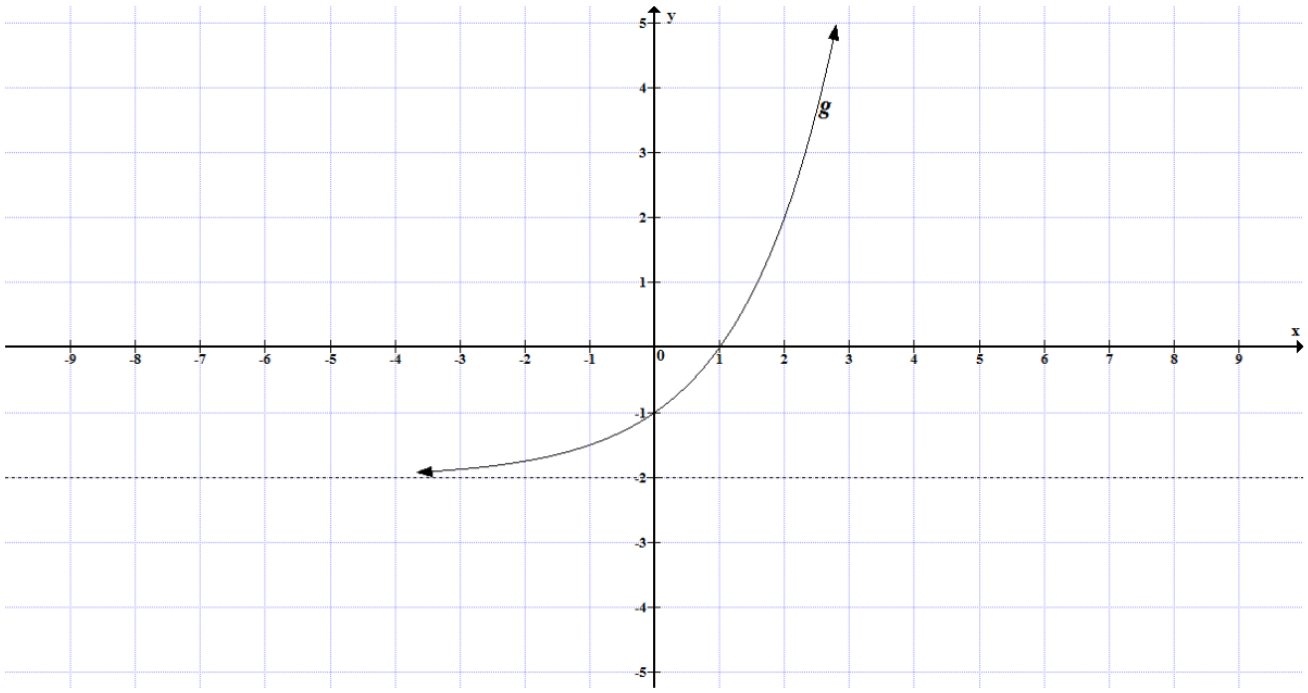
4.4 Write down the equation of the line of symmetry of f, which has a negative gradient. (2)

4.5 Write down the value(s) of x, for which $f(x) \geq g(x)$. (3)

[18]

QUESTION 5

The graph below represents the function g given by $g(x) = a.2^x + q$.



5.1 Write down the domain of g. (1)

5.2 Determine the values of a and q. Hence, write down the equation of g. (4)

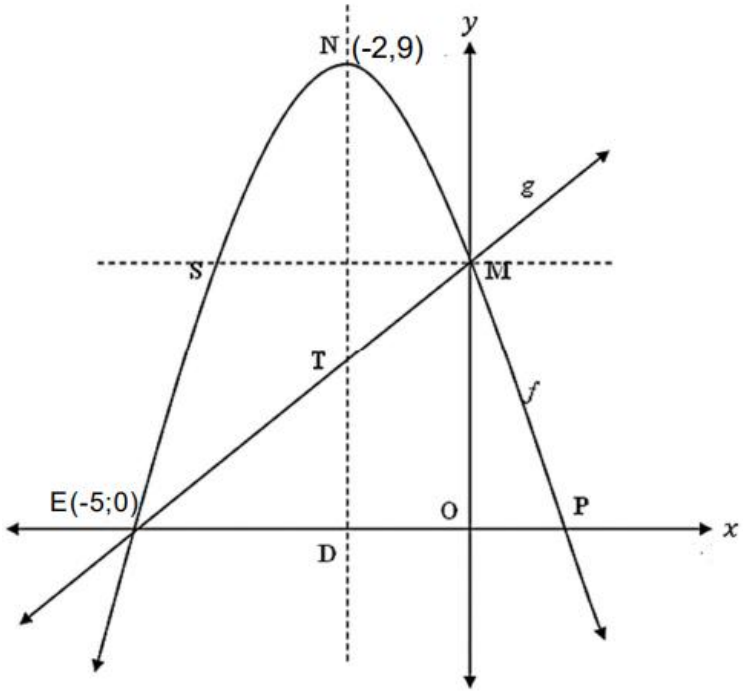
5.3 Determine the value of x if $g(x) = 14$. (3)

[08]

QUESTION 6

The graph below represents the functions defined by $f(x) = a(x + p)^2 + q$ and $g(x) = mx + c$.

- N$(-2; 9)$ is the turning point of $f(x)$.
- E$(-5; 0)$ and M$(0; 5)$ are the points of intersections of f and g with the x and y-axis respectively.
- E and P are points on *f*.



Determine:

6.1 The equation of $g(x)$ and leave your answer in the form $y = mx + c$. (3)

6.2 The coordinates of P. (2)

6.3 The range of *f*. (2)

6.4 The equation of f and leave your answer in the form $y = a(x + p)^2 + q$ (5)

6.5 Use the graph of f to determine the value(s) of k for which $f(x) = k$ will have two unequal negative roots. (2)

6.6 For which values of x will $f(x).g(x) < 0$? (2)

6.7 Write down the equation of h if $h(x)$ is obtained by translating $f(x)$ by 3 units to the right and then reflecting $f(x)$ about the *x*-axis. (3)

[19]

QUESTION 7

7.1 What is the effective annual interest rate for 10,6% per annum, compounded semi-annually? (3)

7.2 The laptop below was purchased at the beginning of 2015 for R12 500 and depreciated at a rate of 14,25% p.a. compounded monthly.

Calculate the depreciated value of the laptop at the beginning of 2022. (3)

7.3 Mr Boyoyo won R250 000 in the recent Powerball draw, and chose to invest all his winnings at a financial institution for 6 years.

- The interest earned on the investment is 9,4% per annum, compounded annually for the first 3 years.
- And 8% per annum, compounded quartely for the remaining years.
- He made a withdrawal of R120 000 at the end of the fourth year to cover renovations of his home.

Calculate the amount that remains in the account at the end of a 6-year investment period. (7)

[13]

QUESTION 8

8.1 Let A and B be two events in a sample space. Suppose that $\mathrm{P(A)} = 0{,}4$; $P(B) = k$ and $P(A \text{ or } B) = 0.7$

For which value of k are A and B mutually exclusive? (2)

8.2 Two identical bags are filled with balls. Bag A contains 3 pink and 2 yellow balls. Bag B contains 5 pink balls and 4 yellow balls. It is equally likely that Bag A or Bag B is chosen. Each ball has an equal chance of bein chosen from the bag. A bag is chosen at random and a ball is then chosen at random from the bag.

8.2.1 Draw a tree diagram to represent all possible outcomes of the data above. (3)

8.2.2 What is the probability that a yellow bag will be chosen from Bag A? (1)

8.3 A survey concerning their holiday preferences was done with 180 staff members.

The options they could choose from were to:

- Go to the coast
- Visit a game park
- Stay at home

The results are indicated in the table below:

	Coast	Game Park	Home	Total
Male	46	24	13	83
Female	52	38	7	97
Total	98	62	20	180

8.3.1 Determine the probability that a randomly selected staff member is male. (1)

8.3.2 Determine the probability that a randomly selected staff member does not prefer visiting a game park. (2)

8.3.3 Are the events ‘staying at home’ and ‘male’ independent events? Motivate your response with the suitable calculations. (4)

[13]

QUESTION 9

A survey of 2 140 teachers revealed that certain learners experience problems that negatively affect their learning. The following data on various problems was recorded:

- 890 teachers said that it was children being **abused (A**).
- 680 teachers said that it was **malnutrition (M)**.
- 900 teachers said that it was by **a lack of parental support (P).**
- 120 teachers said that it was a **lack of parental support (P)** and children being **abused (A)**.
- x teachers said that it was due to a **lack of parental support (P)**, **malnutrition (M)** and children being **abused (A).**
- 110 teachers said that it was a **lack of parental support (P)** and **malnutrition (M)**.
- 140 teachers said that children being **abused (A**) and **malnutrition (M**).
- Every teacher said that learning was negatively affected by at least one problem.

9.1 Draw a Venn diagram to represent the information above. (6)

9.2 What is the total number of teachers who said that learners experienced all three types of problems? (3)

9.3 Calculate the probability that a teacher selected at random from this group said that learner had at least two problems. (3)

[12]

TOTAL: 150