

Hillcrest High School

Grade 11

MATHEMATICS - P1

NOVEMBER 2024

MARKS: 150

EXAMINER: Mrs L. Janssens

TIME: 3 Hours

MODERATOR: Mr D. Reuben

NAME: _____

TEACHER: _____

Q1	Q2	Q3	Q4	Q5	
Q6	Q7	Q8	Q9	Q10	TOTAL

INSTRUCTIONS AND INFORMATION

1. This question paper consists of **10** questions and **8** pages, including this cover page.
2. Clearly show **ALL** calculations, diagrams, graphs, et cetera that you have used in determining your answers.
3. Answers only will **NOT** necessarily be awarded full marks.
4. You may use an approved scientific calculator (non-programmable and non-graphical).
5. If necessary, round off answers to **TWO** decimal places, unless stated otherwise.
6. Diagrams are **NOT** necessarily drawn to scale.
7. Write neatly and legibly.

QUESTION 1

1.1) Solve for x :

1.1.1) $x(x - 1) = 12$ (3)

1.1.2) $x^2 - x = 4$ (answers correct to 1 decimal place) (4)

1.1.3) $x + 5 = \sqrt{3 - 3x}$ (5)

1.1.4) $125^{3x-2} = 25^{4x+10}$ (4)

1.1.5) $x^2 - 2x - 15 < 0$ (3)

1.1.6) $3x^{-3/4} = 24$ (4)

1.2) If $A = \frac{\sqrt{x+4}}{x-2}$ determine the value(s) of x for which:

1.2.1) A is undefined. (1)

1.2.2) A is non-real (1)

1.3) Solve simultaneously for x and y :

$x + y = 2$ and $x^2 + y^2 - 52 = 0$ (6)

1.4) By completing the square, show that $-x^2 - 10x + 12$ has a maximum value of 37. (4)

[35]

QUESTION 2

Simplify without the use of a calculator:

2.1) $\sqrt[3]{125x^6} - \sqrt[4]{81x^8} + \sqrt{36x^4}$ (4)

2.2) $\frac{6 \cdot 2^{2n+3} - 2^{2n+4}}{2 \cdot 2^{2n+2}}$ (4)

2.3) $\sqrt{\frac{15^x \cdot 3^x}{9^{x+1} \cdot 5^{x-2}}}$ (3)

[11]

QUESTION 3

3.1) The following linear sequence is given:

$$-55; -48; -41; \dots \dots \dots ; 85$$

3.1.1) Determine T_n for this sequence. (2)

3.1.2) Find the number of terms in this sequence. (2)

3.1.3) Is the value 10 a term of this sequence?

Show all necessary calculations to justify your answer. (3)

3.2) $p; 2p + 2; 5p + 3$ are the first three terms of a linear sequence.

3.2.1) Find the value of p . (3)

3.2.2) Hence, write down the first three terms of the sequence. (3)

3.3) Given the sequence: 5; 12; 22; 35; ...

3.3.1) Write down the next two terms of the sequence. (2)

3.3.2) Determine T_n for this sequence. (4)

3.3.3) What is the value of the first term greater than 176? (4)

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QUESTION 4

4.1) Leigh-Ann is saving for university and decides to put her money into a savings account paying 10% p.a. compounded semi-annually. She starts her savings with R1 000. After 3 years she deposits another R4 000. After 5 years the interest rate changes to 9%p.a. compounded monthly. How much money is accumulated in the savings account at the end of 10 years? (6)

4.2) Determine the nominal interest rate compounded quarterly if the effective interest rate is 9% p.a. (4)

4.3) At what compound interest rate will an amount double if it is invested for 7 years? (2)

[12]

QUESTION 5

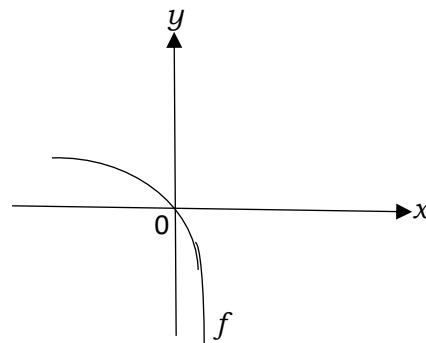
Given $f(x) = \frac{1}{x+4} - 2$

- 5.1) Write down the equations of the asymptotes of f . (2)
- 5.2) Determine the co-ordinates of the x and y intercept(s) of f . (4)
- 5.3) Sketch the graph of f , showing all critical values. (4)
- 5.4) Determine the equation of the axis of symmetry that has the formula $y = x + c$ (3)
- 5.5) If $h(x) = f(x - 3) + 1$ determine the equation of h . (2)
- 5.6) Is f an increasing or decreasing function? Motivate your answer. (2)
- 5.7) Write down the domain of f . (2)

[19]

QUESTION 6

The graph of $f(x) = 1 + a \cdot 2^x$ is shown alongside...

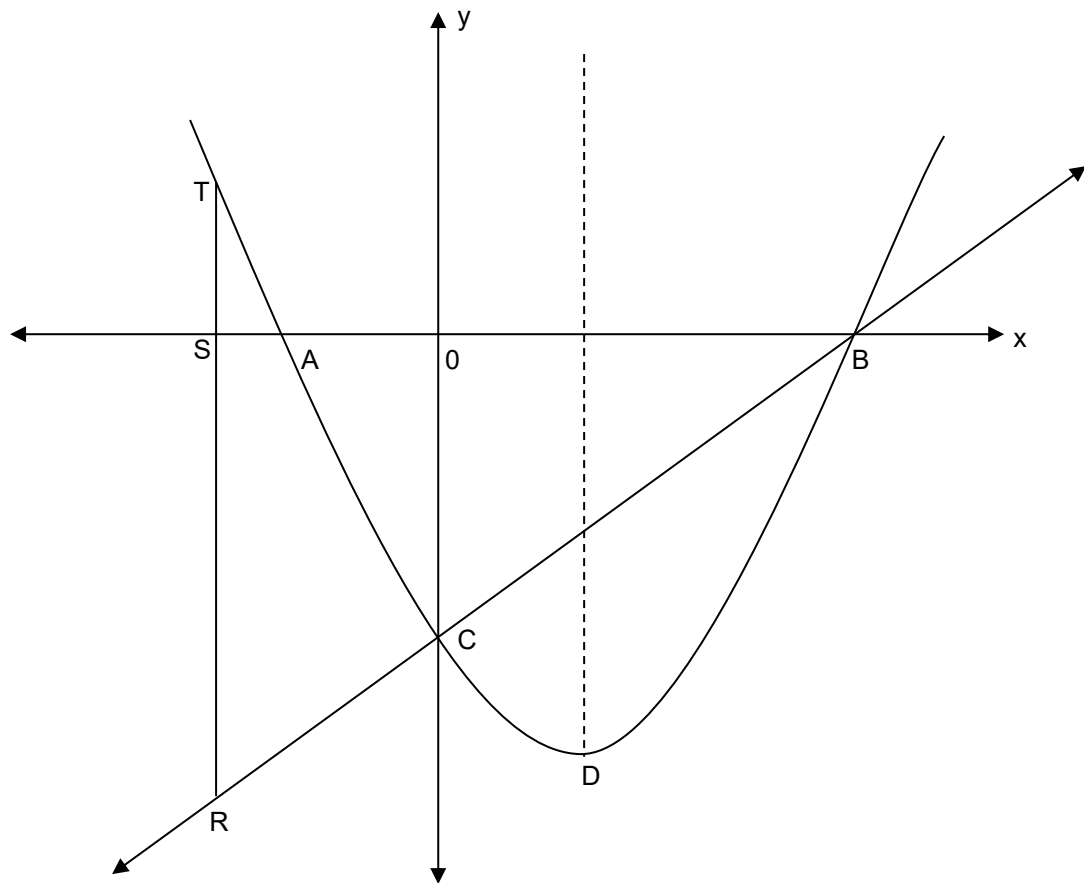


- 6.1) Calculate the value of a . (2)
- 6.2) $P(x; \frac{1}{2})$ lies on the graph of f . Determine the value of x . (2)
- 6.3) Write down the equation(s) of the asymptote(s) of f . (1)
- 6.4) State the range of f . (2)

[7]

QUESTION 7

The sketch shows the graphs of $y = x^2 - 2x - 3$ and $y = mx + c$.



- 7.1) Determine the lengths of OA, OB and OC. (5)
 - 7.2) Determine the co-ordinates of D (the turning point of the parabola). (3)
 - 7.3) Determine the values of m and c . (3)
 - 7.4) Determine the length of OS if $TR = 10$ units. (5)
 - 7.5) State for which values of x the parabola is increasing. (2)
 - 7.6) Use the graph to determine for which values of k the equation $x^2 - 2x + k = 0$ will have real roots. (1)
- [19]**

QUESTION 8

Zama is planning on spending the evening with her friends. She is undecided about what she should wear. She has to choose from the following items that she placed on her bed:

- 2 pairs of pants: jeans (J) or pants (P)
- 3 tops: a white T-shirt (W), a red T-shirt (R) or a blue shirt (B)

- 8.1) Draw a tree diagram to show ALL the possible combinations of pants and tops. (4)
 - 8.2) Each pair of pants and each top have an equal chance of being chosen. Zama chooses her outfit at random.
 - 8.2.1) What is the probability that Zama will wear her jeans and a blue shirt? (2)
- [6]**

QUESTION 9

At the National School of the Arts there are 200 learners in Grade 11. Learners completed their registration forms and the following information was extracted:

- 107 learners take Art
- 90 learners take Dance
- 63 learners take Graphic Design
- 35 learners take Dance and Art
- 23 learners take Art and Graphic Design
- 15 learners take Art and Dance and Graphic Design
- 190 learners take Art or Dance or Graphic Design
- x learners take Graphic Design and Dance but NOT Art

- 9.1) Draw a Venn diagram to represent the given information. (Let D = Dance ; A = Art ; G = Graphic Design) (4)
 - 9.2) How many learners have NOT registered for any of Art or Dance or Graphic Design? (1)
 - 9.3) How many learners have registered for Graphic Design and Dance, but NOT Art? (2)
 - 9.4) What is the probability that a grade 11 learner selected at random has registered for at least two of the subjects? (Indicate your answer correct to THREE decimal places.) (2)
- [9]**

QUESTION 10

In a survey 1530 cross-fit members were asked if they had ever torn a muscle.

The results of the survey were as follows:

	Torn a muscle	Not torn a muscle	TOTAL
Male	463	B	782
Female	A	C	D
TOTAL	913	617	1530

- 10.1) Calculate the values of A, B, C and D. (4)
- 10.2) Calculate the probability of choosing at random, a female cross fitter who has not torn a muscle. (2)
- 10.3) Is being a female cross fitter and having torn a muscle independent? Use calculations, correct to TWO decimal places, to motivate your answer. (3)
- [9]