Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 11

NOVEMBER 2023

MATHEMATICS P1

MARKS: 150

TIME: 3 hours

IMAT1

This question paper consists of 10 pages including an information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

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

QUESTION 1

1.1 Solve for x in the following:

1.1.1 $x^2-3x=0$ (2)

1.1.2 $x(3x+1)=5$ (4)

1.1.3 $2x^2-5x+3<0$ (3)

1.1.4 $2\sqrt{x+2}=x-1$ (5)

1.2 Solve for x and y simultaneously:

$x+3y=2$ and $x^2-3xy=4$ (6)

1.3 Given: $(x-3)^2=p^2-4$

Determine the value(s) of p for which the roots will be non-real. (5)
[25]

QUESTION 2

2.1 Simplify fully, **without using a calculator**: $\dfrac{2^{n+1}-8.2^{n-3}}{2^{n-2}}$ (4)

2.2 Solve for x:

2.2.1 $\sqrt[x]{27}=2187$ (4)

2.2.2 $4^x-16=6.2^x$ (5)

2.3 Given that $x=\sqrt{3}-2$, simplify $\dfrac{x^2+1}{x^2-5}$ **without using a calculator**.
(Give your answer in simplest surd form.) (5)
[18]

QUESTION 3

3.1 Given the linear number pattern: 17 ; 14 ; 11 ; ... ; -247

3.1.1 Write down the fourth and fifth terms of the number pattern. (2)

3.1.2 Determine the general term T_n, of the number pattern. (2)

3.1.3 Calculate the value of T_{17}. (2)

3.1.4 Determine the number of terms in the number pattern. (2)

3.2 In a linear number pattern, the first term is $2x+11$, the second term is 2 and the fourth term is $2x-4$. Calculate the value of x. (5)
[13]

QUESTION 4

4.1 Given the quadratic number pattern: 94 ; 90 ; 82 ; 70 ; ...

4.1.1 Determine the next two terms of the number pattern. (2)

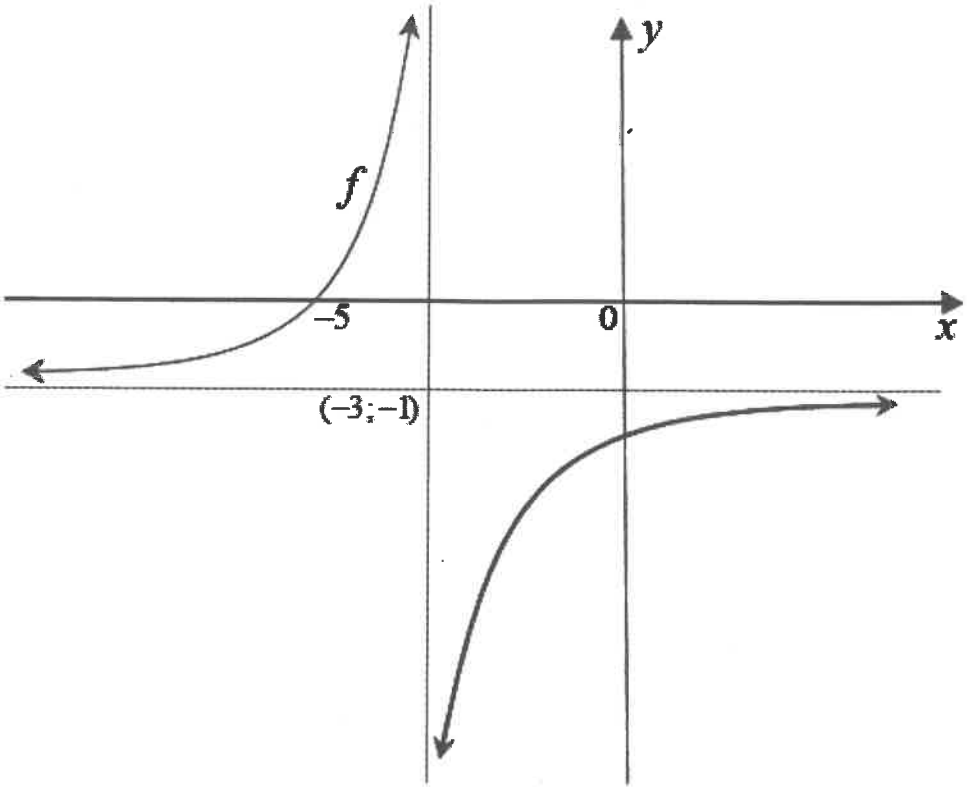
4.1.2 Determine T_n, the general term of the number pattern. (4)

4.1.3 Calculate two consecutive terms whose first difference is -136. (4)

4.2 A quadratic number pattern has a general term $T_n = an^2 + bn - 15$.
$T_2 - T_1 = 3$ and $T_3 - T_2 = 7$. Determine the values of a and b. (5)
[15]

QUESTION 5

The diagram below shows the graph of $f(x)=\frac{a}{x+p}+q$. The asymptotes of f intersect at $(-3;-1)$ and f cuts the x-axis at $x=-5$.



5.1 Write down the values of p and q. (2)

5.2 Determine the value of a. (3)

5.3 Hence, or otherwise calculate the y-intercept of f. (2)

5.4 Write down the domain of f. (2)

5.5 Determine the line of symmetry of f with a negative gradient in the form $y=mx+c$. (2)

5.6 For which values of x is $f(x)\geq 0$? (2)

5.7 Describe the transformation of f to g, given that $g(x)=\frac{2}{x-1}+1$ (4)

[17]

QUESTION 6

Given: $f(x) = 2(3^x) + 1$

6.1 Write down the coordinates of the y-intercept of f. (1)

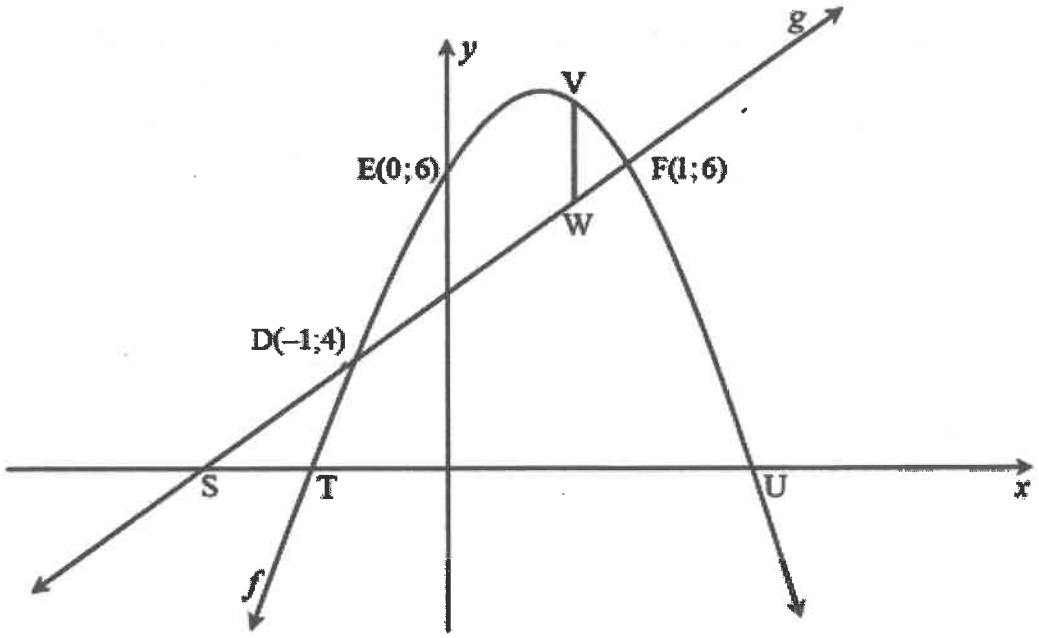
6.2 Write down the equation of asymptote of f. (2)

6.3 Draw a sketch of f, showing clearly the asymptote and intercept(s) with the axes. (3)

6.4 Write down the range of h, if $h(x) = 2(3^{x+1}) - 5$. (2)
[8]

QUESTION 7

The diagram below shows the graphs of $f(x)=ax^2+bx+c$ and $g(x)=mx+q$. D$(-1;4)$ and F$(1;6)$ are points of intersection of f and g. T and U are the x-intercepts of f, E$(0;6)$ the y-intercept of f and S is the x-intercept of g. VW is a straight line drawn parallel to the y-axis.



7.1 Write down the equation of the axis of symmetry of f. (1)

7.2 For which values of x is f decreasing? (1)

7.3 Calculate the average gradient of f between D and E. (2)

7.4 Determine the equation of g. (3)

7.5 Show that $f(x)=-x^2+x+6$. (4)

7.6 Calculate the length of SU. (5)

7.7 Determine the values of x for which $f(x)-g(x)\leq 0$. (2)

7.8 Calculate the maximum length of VW. (3)

[21]

QUESTION 8

8.1 Calculate the effective interest rate per annum if an investment earns interest at a rate of 9,3% p.a. compounded monthly. (3)

8.2 A school buys a bus that costs R312 000 at the start of 2023. The average inflation over the next 5 years is 6,91%. Calculate the cost of replacing the school bus at the end of 5 years. (3)

8.3 Lwandi made an initial deposit of R23 000 into an investment account that paid an interest rate of 9,25% compounded quarterly. After 3 years since the start of his investment, he deposited R13 500 and the interest rate changed to 8,2% p.a. compounded monthly. Exactly 5 years after his initial deposit, Lwandi withdrew R9 000.

8.3.1 Calculate the total value of the investment in Lwandi's account at the end of the 5^{th} year. (5)

8.3.2 At the end of 8 years after the initial deposit, Lwandi decided to withdraw and use the money.
Calculate the annual interest rate of the investment in the final 3 years if his final balance was R64 487,24 and the interest was compounded monthly. (4)
[15]

QUESTION 9

9.1 For any two events A and B, it is given that $P(A) = 0,35$ and $P(A \text{ or } B) = 0,61$. Determine $P(B)$ if:

9.1.1 A and B are mutually exclusive. (3)

9.1.2 A and B are independent. (4)

9.2 A cellphone distribution company investigated the number of defective phones that they obtain from two suppliers, Axis Phones and Direct Phones. They recorded their findings in a contingency table.

	Axis Phones	**Direct Phones**	**Total**
Defective	58	a	b
Not Defective	326	188	514
Total	384	c	600

9.2.1 Determine the values of a, b and c. (3)

9.2.2 Calculate the probability that a cellphone chosen at random is supplied by Direct Phones. (1)

9.2.3 Calculate the probability that a cellphone chosen at random is Not Defective **OR** it is from Axis Phones and Defective. (3)

[14]

QUESTION 10

A bag contains x balls of which 5 are red and the rest are green. One ball is taken out of the bag randomly and it is not replaced. A second ball is taken out of the bag. The probability of picking both green balls is $\frac{3}{11}$. Show that the probability of picking both green balls can be represented by the equation: $4x^2 - 59x + 165 = 0$. **[4]**

TOTAL: 150

