



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

MATHEMATICS P1

NOVEMBER 2026

MARKS: 150

TIME: 3 hours

**This question paper consists of 9 pages, 1 information sheet and
a 22-page SPECIAL ANSWER BOOK.**



INSTRUCTIONS AND INFORMATION

Read the following instructions and information carefully before answering the questions.

1. This question paper consists of 11 questions.
2. Answer ALL the questions in the SPECIAL ANSWER BOOK provided.
3. Clearly show ALL calculations, diagrams, graphs, etc. that you have used in determining your 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...



QUESTION 11.1 Solve for x :

1.1.1 $x^2 + x - 6 = 0$ (3)

1.1.2 $2x + 10 = 3x^2$ (correct to TWO decimal places) (4)

1.1.3 $81.2^{x-4} - 3^x = 0$ (3)

1.1.4 $\sqrt{x+6} \cdot \sqrt{10-x} = 4\sqrt{3}$ (4)

1.2 Solve simultaneously for x and y if:

$y - 2x - 2 = 0$ and $y^2 + 3x^2 - 4 = 0$ (5)

1.3 The product of two numbers is less than 15. The second number is 2 more than the first number. Calculate ALL the possible values of the first number. (5)

[24]**QUESTION 2**

2.1 Consider the arithmetic sequence: $-1 ; -\frac{2}{3} ; -\frac{1}{3} ; \dots ; 27$

2.1.1 Write down the constant difference of the sequence. (1)

2.1.2 How many terms are there in this sequence? (2)

2.1.3 Without calculating the answer, express the sum of the last 65 terms of this sequence in sigma notation. (3)

2.2 The n^{th} term of a geometric series is given by $T_n = (4)^{-n+5}$

2.2.1 Write down the first TWO terms of this series. (2)

2.2.2 Which term of the series is equal to $\frac{1}{1024}$? Show ALL your working. (3)

2.2.3 Determine S_{∞} of this series. (3)

[14]

QUESTION 3

- 3.1 The constant second difference of a quadratic number pattern is -2 . The pattern has a maximum value of 44 at the 8^{th} term. Determine the general term of this quadratic pattern in the form $T_n = an^2 + bn + c$. (4)

- 3.2 There was a hole at the bottom of a rusty water tank. The hole became bigger as water passed through it. A certain amount of water passed through the hole at the end of the first minute. At the end of each minute thereafter, 2 more litres of water passed through the hole than at the end of the previous minute.

If the tank was half full at the end of 36 minutes and empty at the end of 54 minutes, how many litres of water passed through the hole at the end of the first minute? (5)
[9]

QUESTION 4

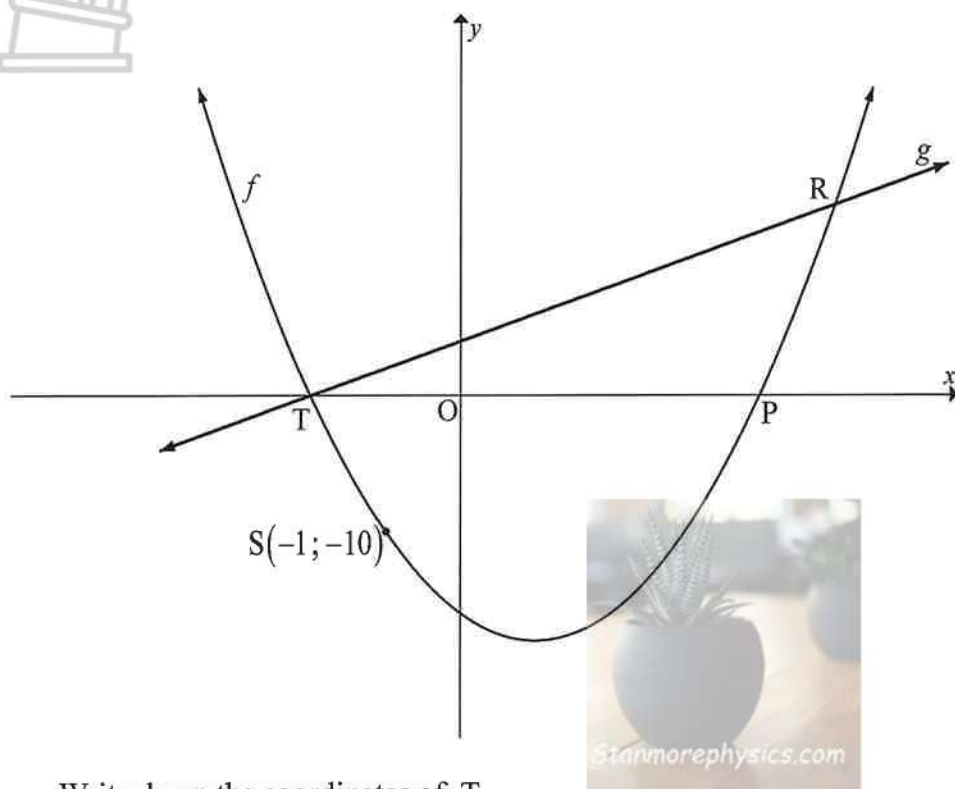
Given the function $f(x) = 5^{-x}$

- 4.1 Explain why f is a decreasing function. (1)
- 4.2 Determine $f^{-1}(x)$, the inverse of $f(x)$, in the form $y = \dots$ (2)
- 4.3 Draw the graphs of f and f^{-1} on the same set of axes provided in the ANSWER BOOK. Clearly show the asymptotes and intercept(s) with the axes for EACH graph. (4)
- 4.4 Write down the values of x for which $f^{-1}(x) \geq -1$ (2)
[9]



QUESTION 5

In the graph below, $S(-1; -10)$ lies on the graph of $f(x) = ax^2 + bx + c$.
 T and P are the x -intercepts of f and $TP = 6$ units. The graph of $g(x) = 2x + 4$ intersects f at T and R .

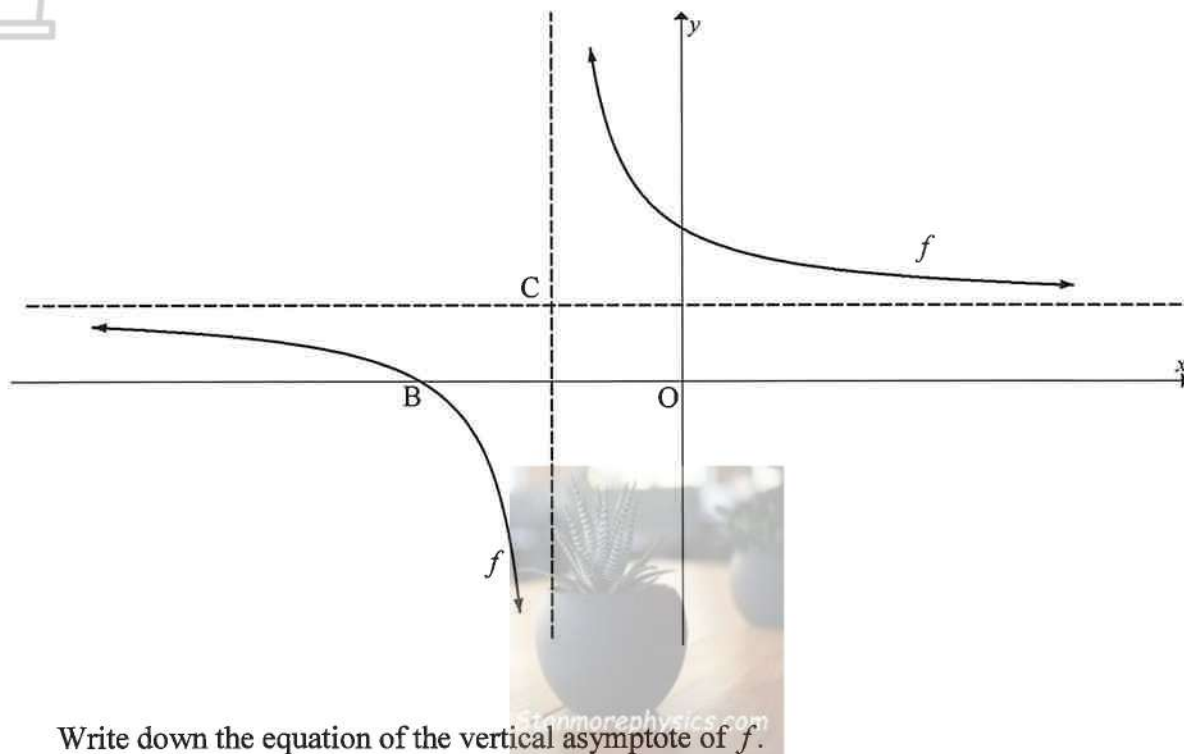


- 5.1 Write down the coordinates of T . (1)
- 5.2 Show that $a = 2$; $b = -4$ and $c = -16$. (4)
- 5.3 Use the graph to determine the values of x for which:
- 5.3.1 $f(x) + 18 > 0$ (3)
- 5.3.2 $g(x) \cdot g^{-1}(x) = 0$, where $g^{-1}(x)$ is the inverse of $g(x)$ (3)
- [11]



QUESTION 6

The graph of $f(x) = \frac{4}{x+2} + 3$ is drawn below. C is the point of intersection of the asymptotes of f and B is the x -intercept of f .



- 6.1 Write down the equation of the vertical asymptote of f . (1)
- 6.2 Write down the range of f . (1)
- 6.3 Calculate the coordinates of B. (3)
- 6.4 Determine the values of k for which $y = -4x + k$ is a tangent to f . (6)
- 6.5 Calculate the distance between B and D, where D is the reflection of B in the line of symmetry of f , having a negative gradient. (5)

[16]



QUESTION 7

- 7.1 Mr Martins bought a car for R465 000. The car depreciates annually at a rate of 11,5% p.a. according to the reducing-balance method. After how many years will the book value of the car be R197 700? (3)
- 7.2 Thadi invests R10 000 into an account earning interest of 6,5% p.a., compounded half-yearly. After 3 years, the interest rate increased to 7% p.a., compounded quarterly. How much will Thadi's investment be worth at the end of 5 years? (4)
- 7.3 Daniella started working on 1 January 1980. At the end of January 1980 and at the end of each month thereafter, she deposited R800 into an annuity fund. She continued doing this until she retired on 31 December 2023.
- 7.3.1 The interest rate for this fund was 7,5% p.a., compounded monthly. Calculate the value of the fund at the time she retired. (4)
- 7.3.2 On 31 December 2023, Daniella invested the full amount of her annuity fund into a savings account that pays interest at 6% p.a., compounded monthly. On 31 January 2024, she made her first withdrawal of a fixed amount from this account for her living expenses. She will continue to withdraw this same amount at the end of each month thereafter for a period of 20 years. Calculate the maximum amount of her monthly withdrawals. (3)

[14]

QUESTION 8

- 8.1 Determine $f'(x)$ from first principles if it is given that $f(x) = -x^2 + x$ (5)
- 8.2 Determine:
- 8.2.1 $g'(x)$ if $g(x) = 3\sqrt[3]{x} - 3x^2$ (3)
- 8.2.2 $\frac{dy}{dx}$ if $y = \frac{4x^3 - x}{2x - 1}$ and $x \neq \frac{1}{2}$ (3)

[11]



QUESTION 9

9.1 Given: $f(x) = -x^3 + 6x^2 - 9x + 4$

9.1.1 Show that $(x-1)$ is a factor of $f(x)$. (1)

9.1.2 Calculate the coordinates of the x -intercepts of f . (3)

9.1.3 Calculate the values of k for which $f(x) = k$ will have three distinct real roots. (5)

9.1.4 The graph of f is concave down for $x > 2$. Determine the values of x for which $g(x) = f(-x) + 2$ will be concave up. (2)

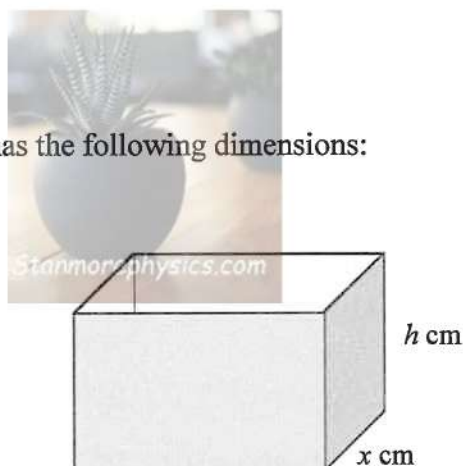
9.2 The equation of the tangent to $f(x) = 3x^3 + ax^2 + bx + c$ at $x = 2$, is given by $y = 3$. The rate at which the gradient of f is changing at $x = 2$, is 0. Calculate the values of a , b and c . (6)

[17]

QUESTION 10

A rectangular box, which is open at the top, has the following dimensions:

- Breadth of x cm
- Length is twice the breadth
- Height of h cm
- Total surface area of 300 cm^2



10.1 Express h in terms of x . (2)

10.2 Show that the volume of the box is given by $V = 100x - \frac{2}{3}x^3$ (2)

10.3 Calculate the maximum volume of the box. (4)

[8]



QUESTION 11

11.1 The following information is known about events A and B:

- $P(\text{only A}) = 0,16$
- $P(\text{A and B}) = 0,3$
- $P(\text{not (A or B)}) = 0,28$

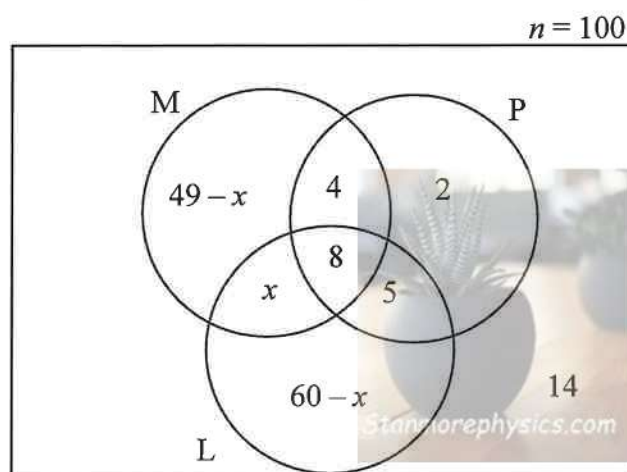
11.1.1 Are events A and B mutually exclusive? Justify your answer.

(2)

11.1.2 Determine $P(B)$.

(3)

11.2 A survey was conducted among 100 learners to establish how many of them took Mathematics (M), Physical Sciences (P) and Life Sciences (L). The results are shown in the Venn-diagram below, where x represents the number of learners who took Mathematics and Life Sciences but not Physical Sciences.



11.2.1 Show that $x = 42$.

(1)

11.2.2 Is taking Mathematics independent of taking Life Sciences? Justify your answer by showing ALL your working.

(5)

11.3 The tuckshop at a school sells 3 different flavours of cold drinks, 2 different flavours of energy drinks and 4 different flavours of fruit juices. A worker at the tuckshop chose ONE bottle of EACH flavour of the 3 different types of drinks available, to display in a row on a shelf.

11.3.1 In how many different ways can the bottles of drinks be arranged on the shelf if they can be arranged in any order?

(1)

11.3.2 The juice is in glass bottles. While the worker was arranging the chosen bottles on the shelf, a few bottles of juice fell and broke. The worker continued to arrange the remaining bottles of drinks. The probability of arranging the bottles of drinks such that an energy drink is at the beginning and at the end of the row is now $\frac{1}{21}$. How many bottles of juice broke?

Show ALL your calculations.

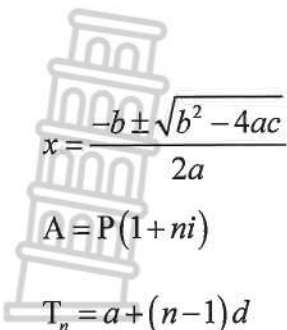
(5)

[17]

TOTAL: 150



INFORMATION SHEET: MATHEMATICS



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

$$A = P(1 + ni)$$

$$A = P(1 - ni)$$

$$A = P(1 + i)^n$$

$$A = P(1 - i)^n$$

$$T_n = a + (n-1)d$$

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

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(r^n - 1)}{r - 1}; r \neq 1$$

$$S_\infty = \frac{a}{1 - r}; -1 < r < 1$$

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

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

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

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$M\left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2}\right)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

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

$$\text{In } \triangle ABC: \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

$$\text{area } \triangle ABC = \frac{1}{2} ab \sin C$$

$$\sin(\alpha + \beta) = \sin \alpha \cos \beta + \cos \alpha \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cos \beta - \cos \alpha \sin \beta$$

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

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

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

$$\sin 2\alpha = 2 \sin \alpha \cos \alpha$$

$$\bar{x} = \frac{\sum_{i=1}^n x_i}{n}$$

$$\sigma^2 = \frac{\sum_{i=1}^n (x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)}$$

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

$$\hat{y} = a + bx$$

$$b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$



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Candidate Barcode label/Stafieskodeplakker

NSC Answer Book
NSS-antwoordeboek

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CENTRE NUMBER SENTRUMNOMMER							
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DATE <i>DATUM</i>	
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PAPER NUMBER VRAESTELNOMMER	1
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SUBJECT NAME VAKNAAM	MATHEMATICS/WISKUNDE
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**CONTROLLED AND CERTIFIED CORRECT
(SURNAME AND INITIALS OF EA)
GEKONTROLEER EN AS KORREK
GESERTIFISEER (VAN EN VOORLETTERS
VAN EA)**

READ INSTRUCTIONS ON THE NEXT PAGE,
LEES INSTRUKSIES OP DIE VOLGENDE BLADSY.

This answer book consists of 22 pages./Hierdie antwoordeboek bestaan uit 22 bladsye.



Please turn over/*Blaai om asseblief*

PLEASE FOLLOW THESE INSTRUCTIONS CAREFULLY	VOLG ASSEBLIEF HIERDIE INSTRUKSIES NOUKEURIG
1. Clearly write your examination number and centre number in the space provided and attach your barcode label in the space provided. 2. Remember that your own name (or the name of your school) may not appear anywhere on or in this answer book. 3. Answer ALL questions in the spaces provided. 4. NO pages may be torn from this answer book. 5. Read the instructions printed on your timetable carefully as well as any other instructions which may be given in each examination paper. 6. Candidates may NOT retain an answer book or remove it from the examination room. 7. Answers must be written in black/blue ink as distinctly as possible. Do NOT write in the margins. 8. Write the numbers of the questions you have answered on the front cover of the answer book where marks are to be recorded. 9. If you require additional space for your answers: 9.1 Use the additional space provided at the end of the answer book. 9.2 When answering a question in the additional space, indicate clearly the question number in the column on the LHS. 9.3 Rule off after each answer. 10. Draw a neat line through any work/rough work that must not be marked.	1. Skryf jou eksamennommer en sentrumnummer duidelik in die ruimtes soos verskaf en plak jou stafieskodeplakker in die ruimte soos verskaf. 2. Onthou dat jou eie naam (of die naam van jou skool) nie op of in hierdie antwoordeboek mag voorkom nie. 3. Beantwoord ALLE vrae in die ruimtes wat voorsien is. 4. GEEN bladsye mag uit hierdie antwoordeboek geskeur word NIE. 5. Lees die instruksies wat op jou eksamenrooster gedruk is, sorgvuldig deur, asook enige ander instruksies wat op elke eksamenvraestel gegee word. 6. GEEN antwoordeboek mag deur die kandidaat behou of uit die eksamenlokaal verwyder word NIE. 7. Skryf die antwoorde so duidelik moontlik met swart/blou ink. Moet NIE in die kantlyne skryf NIE. 8. Skryf die nommers van die vrae wat jy beantwoord het op die voorblad van die antwoordeboek waar die punte aangebring word. 9. In geval jy bykomende ruimte benodig vir jou antwoorde: 9.1 Gebruik die bykomende ruimte wat aan die einde van die antwoordeboek voorsien word. 9.2 As 'n vraag in die bykomende ruimte beantwoord word, dui duidelik die vraagnommer in die kolom aan die LK aan. 9.3 Trek 'n lyn na elke antwoord. 10. Trek 'n netjiese lyn deur enige werk/rofwerk wat nie nagesien moet word nie...



QUESTION/VRAAG 1

	Solution/Oplissing	Marks Punte
1.1.1		(3)
1.1.2		(4)
1.1.3		(3)
1.1.4		(4)



	Solution/Oplissing	Marks Punte
1.2	 	
1.3		(5)
		(5)
		[24]



QUESTION/VRAAG 2

	Solution/Oplissing	Marks Punte
2.1.1		(1)
2.1.2		(2)
2.1.3		(3)
2.2.1		(2)
2.2.2		(3)
2.2.3		(3)
		[14]

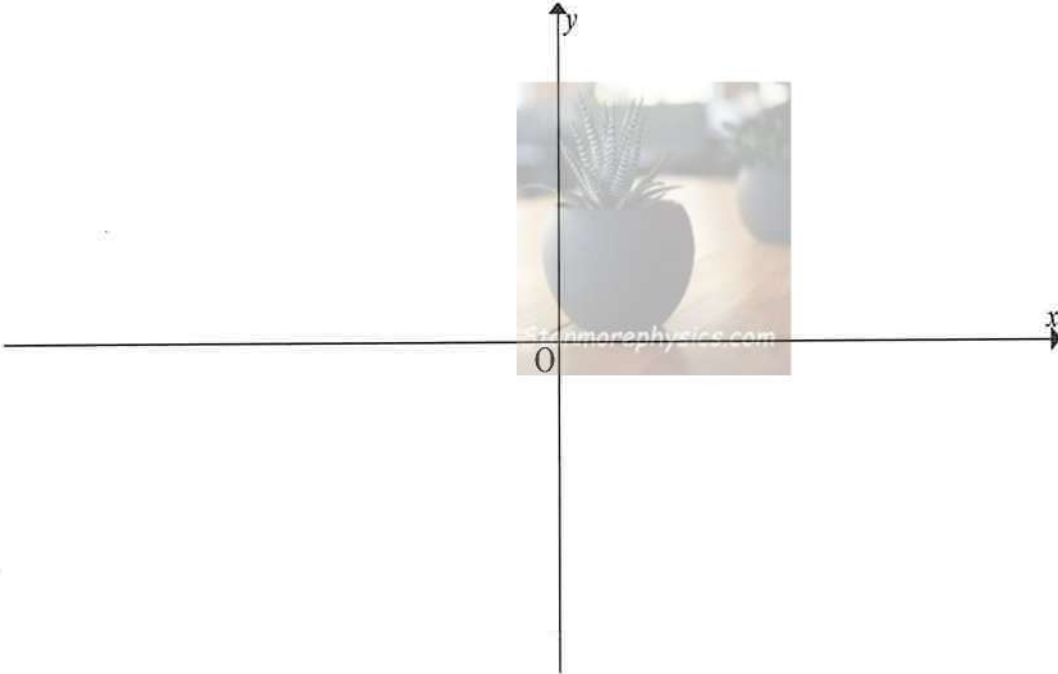


QUESTION/VRAAG 3

	Solution/Oplissing	Marks Punte
3.1		(4)
3.2		(5)
		(5)
		[9]

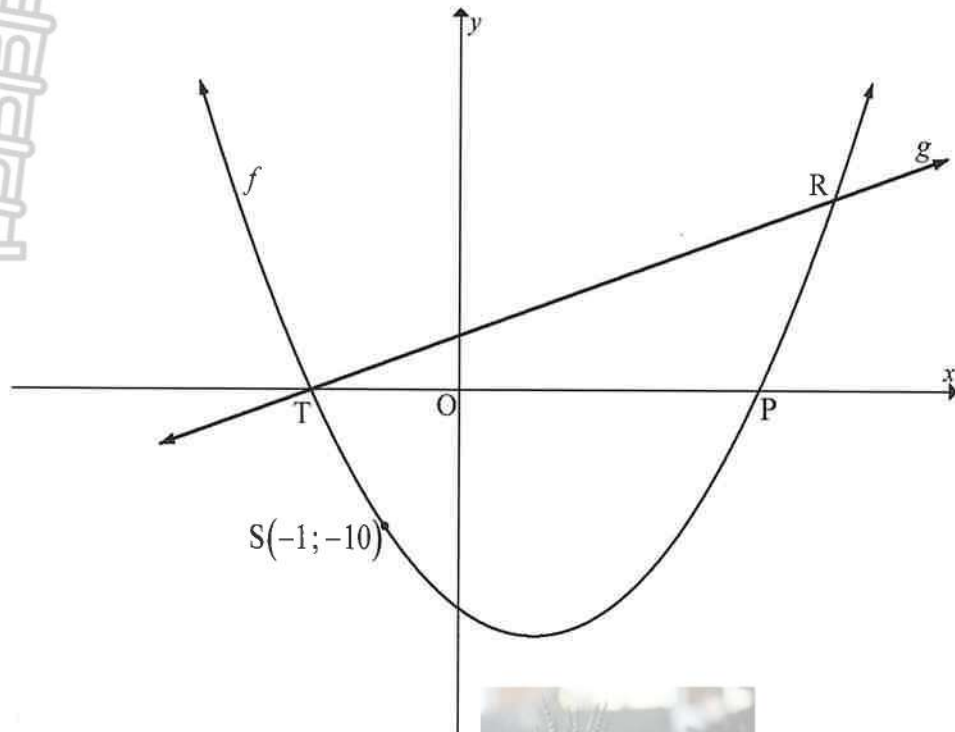


QUESTION/VRAAG 4

	Solution/Oplossing	Marks Punte
4.1		(1)
4.2		(2)
4.3		(4)
4.4		(2)
[9]		



QUESTION/VRAAG 5



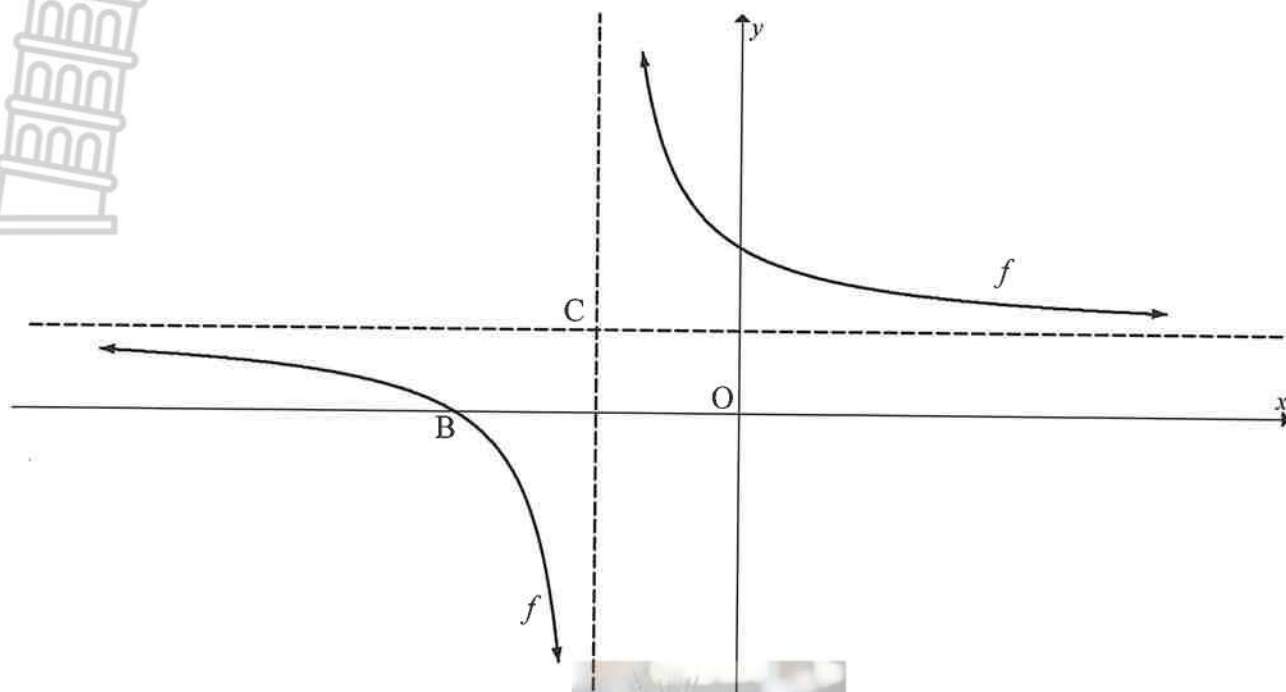
	Solution/Oplissing	Marks Punte
5.1		(1)
5.2		(4)



	Solution/Oplossing	Marks Punte
5.3.1		(3)
5.3.2		(3)
		[11]



QUESTION/VRAAG 6



	Solution/Oplissing	Marks Punte
6.1		(1)
6.2		(1)
6.3		(3)



	Solution/Oplissing	Marks Punte
6.4		(6)
6.5		(5)
		[16]



QUESTION/VRAAG 7

	Solution/Oplissing	Marks Punte
7.1		(3)
7.2		(4)
7.3.1		(4)





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8.1	So
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QUESTION/VRAAG 9

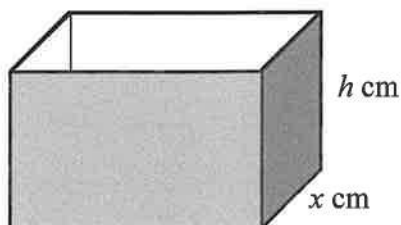
	Solution/Oplossing	Marks Punte
9.1.1		(1)
9.1.2		(3)
9.1.3		(5)
9.1.4		(2)



	Solution/Oplossing	Marks Punte
9.2		
		(6)
		[17]



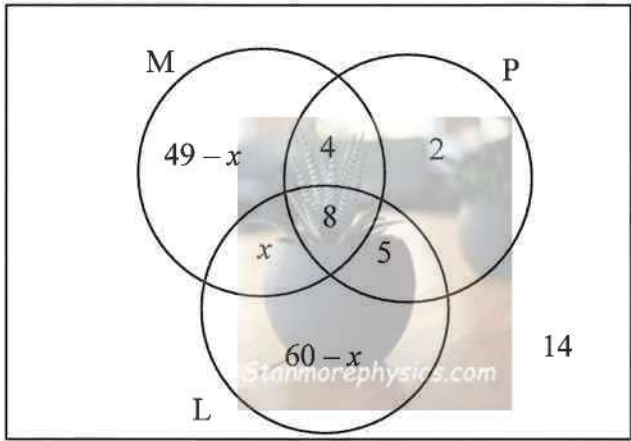
QUESTION/VRAAG 10



	Solution/Oplissing	Marks Punte
10.1		(2)
10.2		(2)
10.3		(4)
		[8]



QUESTION/VRAAG 11

	Solution/Oplossing	Marks Punte
11.1.1		(2)
11.1.2		(3)
11.2	$n = 100$ 	(1)
11.2.1		
11.2.2		(5)



11.3.1		(1)
11.3.2		(5)
		(5)
		[17]



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TOTAL/TOTAAL: 150





RE-MARK/RE-CHECK HERMERK/HERSIEN				
Question <i>Vraag</i>	Marks <i>Punte</i>			Initials <i>Voorletters</i>
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TOTAL TOTAAL				
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