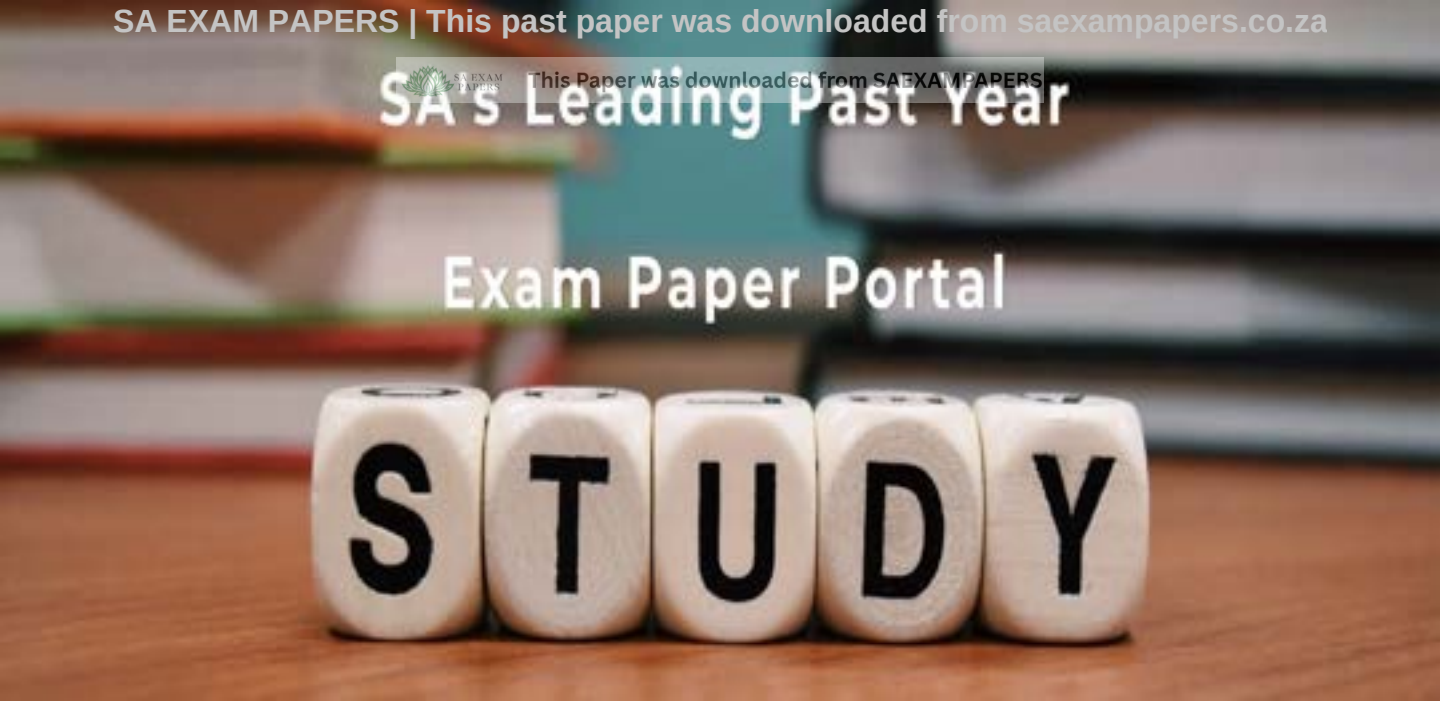


education

MPUMALANGA PROVINCE

REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P1

SEPTEMBER 2025

MARKS: 150

TIME: 3 HOURS

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

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.

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]

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)

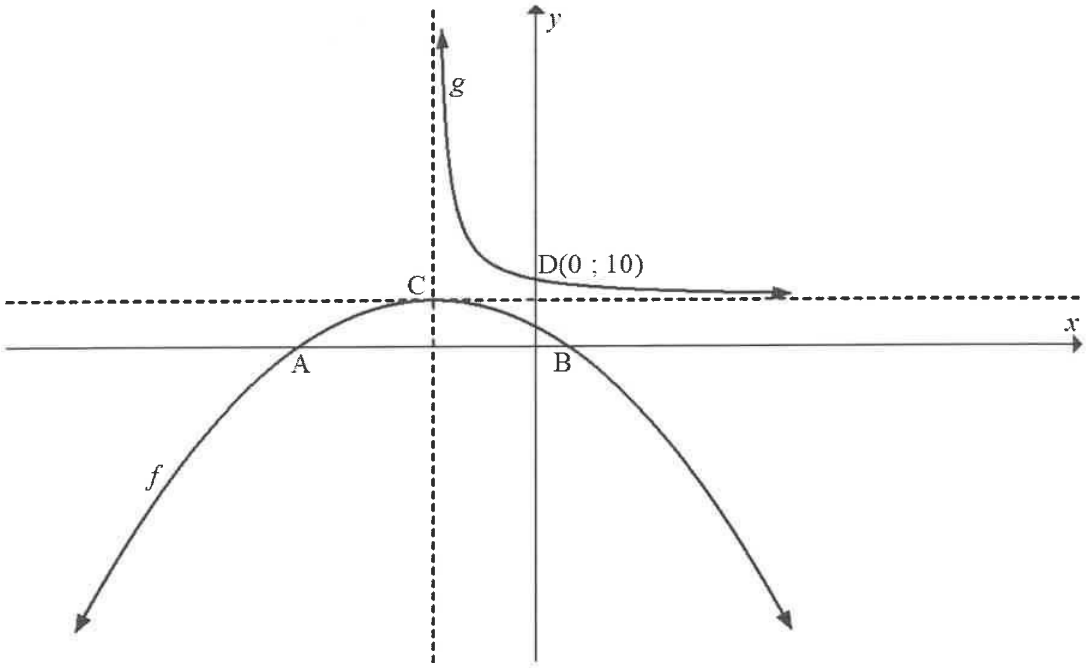
3.2 The sum of the first n terms of a geometric series $9 + 6 + 4 + \ldots$ is greater than 25.
Calculate the smallest value of n that will give a sum greater than 25. (6)

[11]

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]

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]

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:

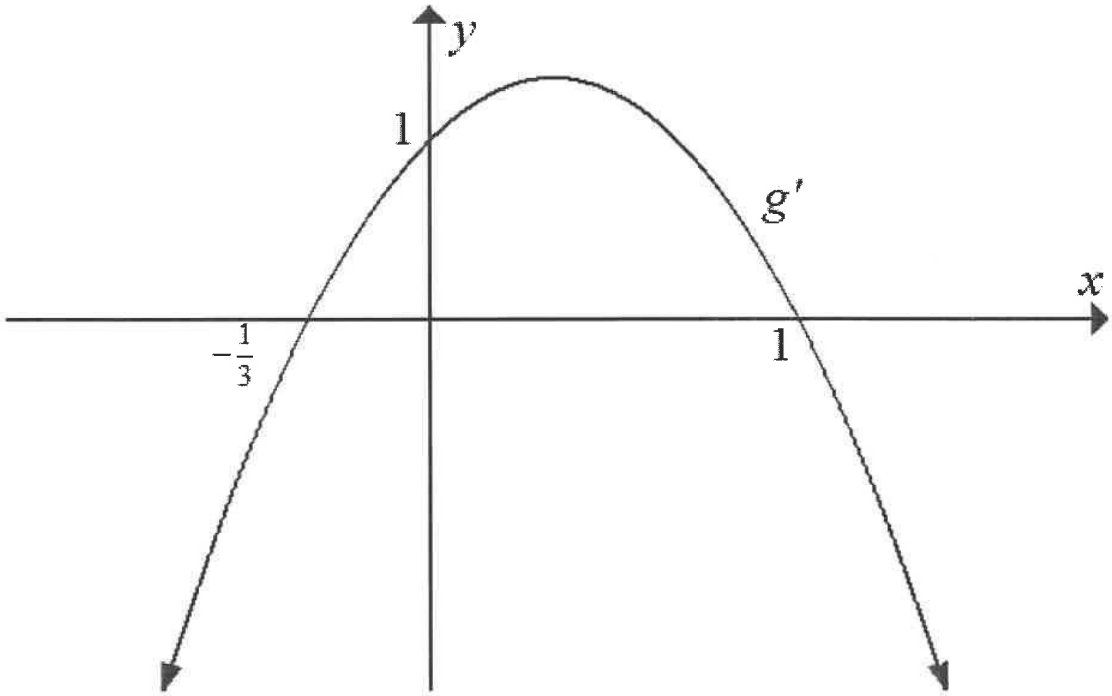
7.2.1 $f'(x)$ if $f(x)=-\frac{5}{x^2}+(4x-1)\pi$ (3)

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]

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 :

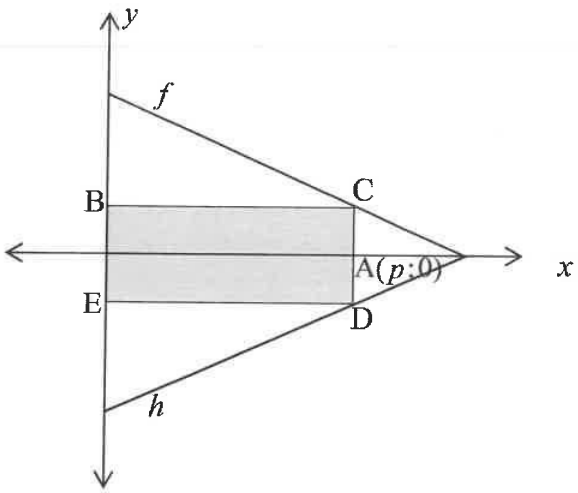
- $g(x) + 1$ passes through point $(0;0)$
- $g'(x) = -3x^2 + 2x + 1$

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

[15]

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]

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

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

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

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

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

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

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

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

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

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

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

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

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NSC Answer Book
NSS-Antwoordeboek

SCHOOL NAME *SKOOL NAAM*		DISTRICT *DISTRIK*	
SURNAME AND NAME *VAN EN NAAM*		CLASS *KLAAS*	
DATE *DATUM*			
SUBJECT NAME *VAKNAAM*	MATHEMATICS P1/*WISKUNDE V1*		

MARKER/*NASIENER*				MODERATOR'S INITIALS IN RELEVANT BLOCK/ *MODERATORPARAAF IN BETROKKE BLOKKIE*											
Question *Vraag*	Marks *Punte*	Marker's Code & Initials	Marks *Punte*	SM	Marks *Punte*	DCM	Marks *Punte*	CM	Marks *Punte*	IM	Marks *Punte*	EM
1												
2												
3												
4												
5												
6												
7												
8												
9												
10												
11												
TOTAL *TOTAAL*												

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. Your name, surname, school and class must be clearly written in the space provided.	1. *Skryf jou naam, van, skool en klaas duidelik in die ruimtes verskaf.*
2. Answer ALL questions in the spaces provided.	2. *Beantwoord ALLE vrae in die ruimtes wat verskaf is.*
3. No pages may be torn from this answer book.	3. *Geen bladsye mag uit hierdie antwoordeboek geskeur word nie.*
4. Read the instructions printed on your timetable carefully as well as any other instructions which may be given in each examination paper.	4. *Lees die instruksies wat op jou eksamenrooster gedruk is sorgvuldig deur, asook enige ander instruksies wat in elke eksamenvraestel gegee word.*
5. Candidates may not retain an answer book or remove it from the examination room. Answer books must be returned to the Invigilator at the end of the examination session.	5. *Geen antwoordeboek mag deur die kandidaat behou of uit die eksamenlokaal verwyder word nie. Antwoordeboeke moet aan die einde van die eksamensessie aan die toesighouer terugbesorg word.*
6. Answers must be written in black/blue ink as distinctly as possible. Do NOT write in the margins.	6. *Skryf die antwoorde so duidelik moontlik met swart/blou ink. MOENIE in die kantlyne skryf NIE.*
7. Indicate the questions you have answered by drawing a circle around the relevant numbers on the front cover of the answer book where marks are to be recorded.	7. *Dui die vrae wat jy beantwoord het op die voorblad van die antwoordeboek aan, waar die punte aangebring word, deur 'n kringetjie om die nommers van die vrae wat jy beantwoord het, te trek.*
8. Draw a neat line through any work/rough work that must not be marked.	8. *Trek 'n netjiese lyn deur enige werk/rofwerk wat nie nagesien moet word nie.*
9. In the event that you use the additional space provided at the end of this ANSWER BOOK: 9.1 Write down the question number. 9.2 Leave a line and rule off after your answer.	9. *In geval jy die bykomende ruimte wat aan die einde van hierdie ANTWOORDEBOEK verskaf is, gebruik:* *9.1 Skryf die vraagnommer neer* *9.2 Laat 'n lyn oop en trek 'n lyn na jou antwoord.*

QUESTION 1/*VRAAG* 1

	Solution/*Oplossing*	**Marks** *Punte*
1.1.1		(2)
1.1.2		(3)
1.1.3		(4)

	Solution/*Oplossing*	**Marks** ***Punte***
1.1.4		(3)
1.1.5		(4)

	Solution/*Oplossing*	**Marks** ***Punte***
1.2		(6)
1.3		(4)
		[26]

QUESTION 2/*VRAAG* 2

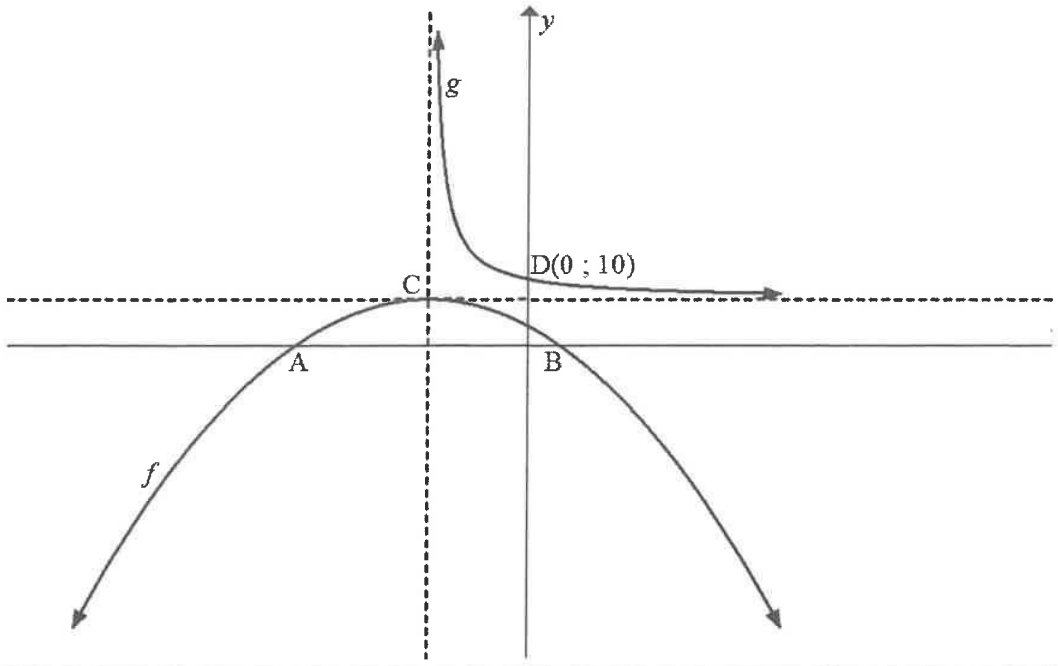
	Solution/*Oplossing*	**Marks** *Punte*
2.1.1		(2)
2.1.2		(2)
2.1.3		(3)

	Solution/*Oplossing*	**Marks** *Punte*
2.1.4		(2)
2.2		(5)
		[14]

QUESTION/*VRAAG* 3

	Solution/*Oplossing*	**Marks** *Punte*
3.1.1		(3)
3.1.2		(2)
3.2		(6)
		[11]

QUESTION/*VRAAG* 4



	Solution/*Oplossing*	**Marks** *Punte*
4.1		(4)

	Solution/*Oplossing*	**Marks** *Punte*
4.2		(3)
4.3		(4)
4.4		(2)
4.5		(2)
4.6		(2)
		[17]

QUESTION 5/*VRAAG* 5

	Solution/*Oplossing*	**Marks** *Punte*
5.1.1		(1)
5.1.2		(2)
5.1.3		(5)
5.1.4		(2)

	Solution/*Oplossing*	**Marks** *Punte*
5.1.5		(1)
5.2.1		(2)
5.2.2		(1)
		[14]

QUESTION 6/*VRAAG* 6

	Solution/*Oplossing*	**Marks** *Punte*
6.1		(2)

	Solution/*Oplossing*	**Marks** *Punte*
6.2.1		(5)
6.2.2		(2)
6.2.3		(1)

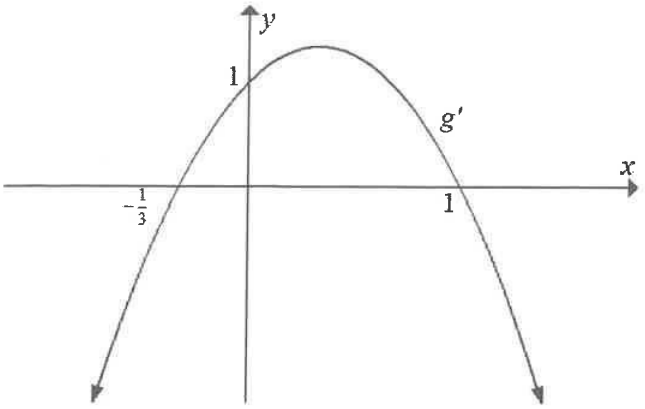
	Solution/*Oplossing*	**Marks** ***Punte***
6.3.1		(4)
6.3.2		(3)
		[17]

QUESTION/*VRAAG* 7

	Solution/*Oplossing*	**Marks** *Punte*
7.1		(4)
7.2.1		(3)

	Solution/*Oplossing*	**Marks** ***Punte***
7.2.2		(4)
7.2.3		(2)
		[13]

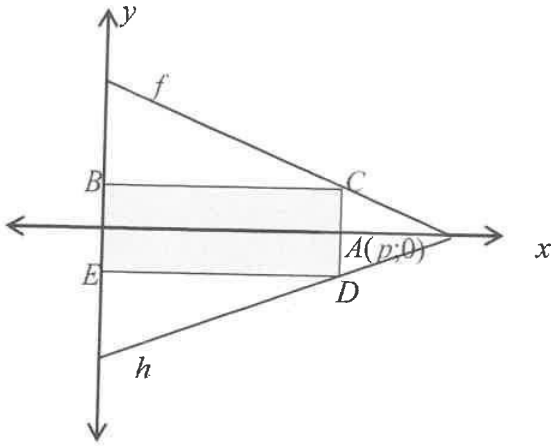
QUESTION 8/*VRAAG* 8



	Solution/*Oplossing*	**Marks** *Punte*
8.1		(2)
8.2		(2)
8.3		(2)

	Solution/*Oplossing*	**Marks** *Punte*
8.4		(4)
8.5		(5)
		[15]

QUESTION 9/*VRAAG 9*



	Solution/*Oplossing*	**Marks** *Punte*
9.1		(3)
9.2		(5)
		[8]

QUESTION 10/VRAAG 10

	Solution/*Oplossing*	**Marks** ***Punte***
10.1.1		(3)
10.1.2		(1)
10.1.3		(1)
10.1.4		(3)

	Solution/*Oplossing*	**Marks** ***Punte***
10.2.1		(3)
10.2.2		(3)
10.2.3		(1)
		[15]

ADDITIONAL SPACE/*ADDISIONELE SPASIE*

ADDITIONAL SPACE/*ADDISIONELE SPASIE*

	Solution/*Oplossing*	**Marks** ***Punte***

TOTAL/*TOTAAL*: 150