



education

**MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA**

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

MATHEMATICS P1

JUNE 2026

MARKS: 150

TIME: 3 HOURS

This question paper consists of 7 pages and an information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. The question paper consists of 9 questions and information sheet.
2. Answer ALL the questions.
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. Write neatly and legibly.



QUESTION 1		
1.1	Solve for x :	
1.1.1	$\left(\frac{3x}{2} + 5\right)(x^2 - 7) = 0$ a) if x is a rational number b) if x is an irrational number	(1) (1)
1.1.2	$-4x^2 + 6x = 1$ (Correct to 2 decimal places)	(4)
1.1.3	$x - \sqrt{x+8} = -2$	(4)
1.1.4	$x^2 + 5x \leq 0$	(3)
1.1.5	$3 \cdot 2^{x+1} + 2^{2x} = 40$	(4)
1.2	Solve the following system of simultaneous equations:	
	$3^{x+2y} = \frac{9^{3y}}{27}$ and $x^2 - 10y^2 + 6y + 3 = 0$	(6)
1.3	Given the equation: $x = -p \pm \sqrt{2p+1}$ Write down two positive values of p for which the roots are rational and real.	(3)
1.4	A circle has a circumference of 10π cm. A solid cylinder with the same circular base has a surface area of 90π cm ² . Calculate the radius of the base and the height of the cylinder.	(3)
		[29]

QUESTION 2		
2.1	The first three differences of a quadratic sequence are $-12; -10; -8$. The first term of the quadratic sequence is 39.	
2.1.1	Determine the n^{th} term of the quadratic sequence.	(3)
2.1.2	Will this quadratic sequence have one minimum term? Explain your answer with the necessary calculations.	(2)
2.2	Given: $\sum_{n=0}^{\infty} \left(\frac{3+x}{3}\right)^n$	
2.2.1	Present the sum to infinity in terms of x .	(2)
2.2.2	For which values of x will the sum to infinity converge?	(3)
2.2.3	If $x = -2$, calculate the sum to infinity.	(1)
		[11]

QUESTION 3

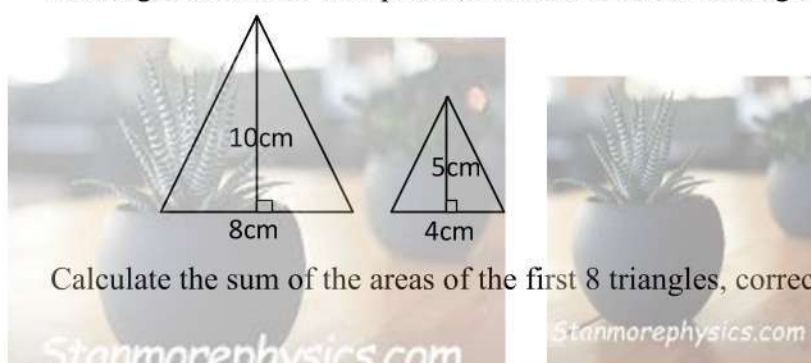
3.1 Given the arithmetic sequence given: 25; 28; 31; ... ; 265

3.1.1 Determine the number of terms in this sequence. (2)

3.1.2 Write the sequence in sigma-notation. (2)

3.1.3 If this sequence continues, calculate the smallest number of terms that must be added to the sequence so that the sum of all the terms will be more than 15 000. (4)

3.2 A series of isosceles triangles are given. The first triangle has a base of 8cm and a perpendicular height of 10 cm. A second, smaller triangle is drawn where the base and the height is halved. This process continues and forms a geometric pattern.



Calculate the sum of the areas of the first 8 triangles, correct to three decimal places. (3)

[11]

QUESTION 4

Given: $f(x) = a^x - 1$ for $a > 0$. $(2; \frac{4}{9})$ is a point on f .

4.1	Calculate the value of a .	(2)
4.2	Write down the range of f .	(1)
4.3	It is further given that $C(x; \frac{5}{4})$ is a point on f . Determine the coordinates of C' , the image of C , when C is reflected about the line $y = x$.	(3)
4.4	Is C' a point on f ? Explain your answer.	(2)
4.5	Give the equation of g if $g(x) = f(x) + 1$.	(1)
4.6	Give the equation of $g^{-1}(x)$ in the form $y = \dots$	(2)
4.7	On the same set of axes, draw the graphs of g , g^{-1} as well as the symmetry axis. Clearly show the intercepts with the axes and asymptotes, if any, as well as one other point on each graph.	(5)
4.8	For which values of x is $g^{-1}(x) < 0$?	(1)
		[17]

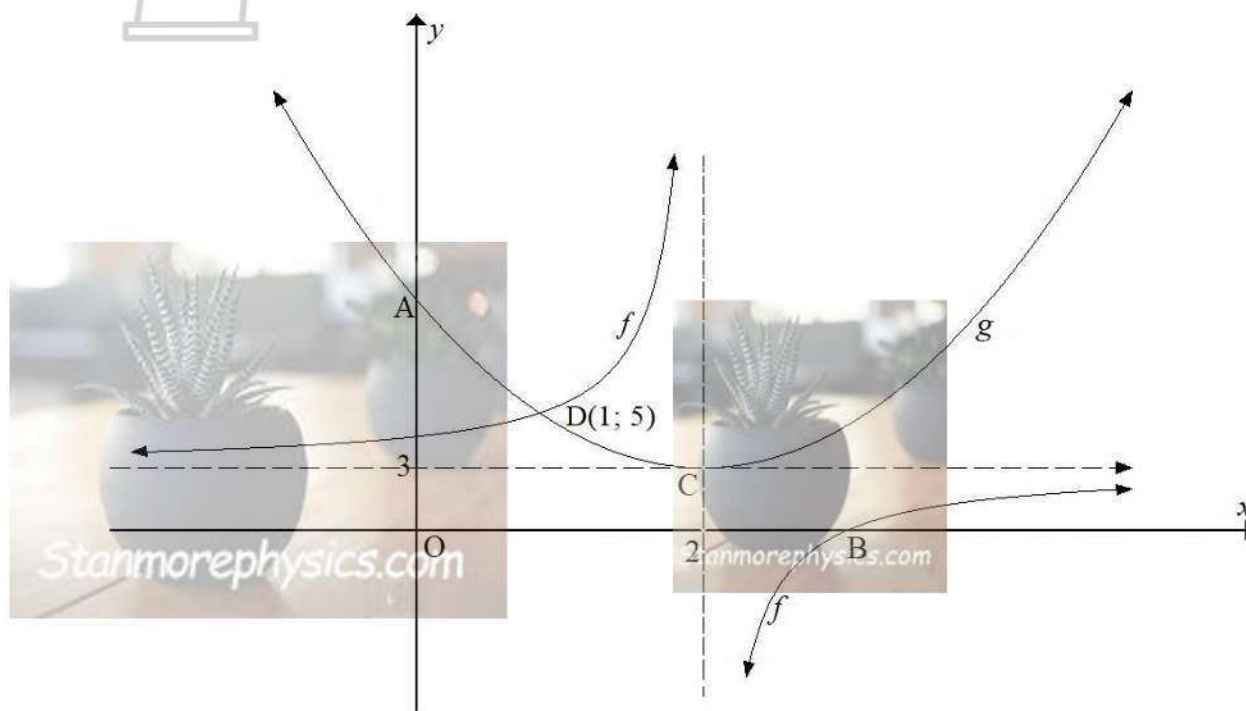
QUESTION 5

Given: The graphs of $f(x) = \frac{k}{x-2} + 3$ and $g(x) = a(x-p)^2 + q$ are sketched.

A and B are the y and x -intercepts of g and f respectively.

C is the turning point of g and lies on both asymptotes of f .

D(1; 5) is a point of intersection of f and g .



- 5.1 Determine the equation of g in the form $g(x) = a(x-p)^2 + q$. (3)
- 5.2 Prove that the value of $k = -2$. (1)
- 5.3 Determine the length of AB if $g(x) = 2x^2 - 8x + 11$. (4)
- 5.4 Determine the equation of the symmetry-axis of f with a negative gradient. (2)
- 5.5 Determine the value(s) of x so that $f(x) - g(x) \leq 0$. (2)
- 5.6 Determine the value(s) of m so that $g(x) + m = 0$ has two distinct roots. (2)
- 5.7 The graph of g is translated 2 units to the right and 2 units down to form h . Give the equation of h in the form $h(x) = a(x+p)^2 + q$. (2)

[16]

QUESTION 6			
6.1	An amount of money was invested at a rate of 7% p.a, compounded quarterly. Calculate the effective interest rate.		(3)
6.2	Githa bought a car for R790 000 five years ago. The car depreciated on the reducing balance method to R453 672, 30. Calculate the rate of depreciation.		(3)
6.3	Dino deposits R15 000 in a bank account at an interest rate of 9,1% p.a., compounded monthly. Two years later he withdraws R3 000. Three years after the initial deposit, the interest rate changed to 8,5% p.a. compounded half-yearly. Determine the value of the interest he received at the end of the seven years.		(6)
6.4	How long must an amount of money be invested to double in value at an interest rate of 7,95% p.a. on the straight line method? Give your answer in years and months.		(3)
			[15]

QUESTION 7			
7.1	Use first principles to find the derivative of f : $f(x) = -4x^2 - 3$		(5)
7.2	Determine:		
7.2.1	$D_x [-(2x-1)^2]$		(3)
7.2.2	$\frac{d}{dx} \left[\frac{1 - \sqrt[3]{x^2} + \pi x}{6x} \right]$		(6)
7.2.3	$g'(x)$ if $g(x) = \frac{x^3 - 8}{x - 2}$		(2)
7.3	Given: $p(x) = -4x^3 + x^2 - 3x + 5$ Determine the interval for which p is concave up.		(3)
			[19]

QUESTION 8		
The equation of the cubic function f is given as $f(x) = x^3 - 5x^2 + 8x - 4$ $= (x - 1)(x^2 - 4x + 4)$		
8.1	Calculate the coordinates of the stationary points of f .	(4)
8.2	Give the x -intercepts of f in coordinate form.	(2)
8.3	Sketch the graph of f , clearly indicating the intercepts with the axes and the turning points.	(3)
8.4	For which values of x is $f(x) \leq 0$?	(2)
8.5	Determine the equation of the tangent to the curve at the point $x = 3$.	(3)
8.6	If $f(x) - k = 0$ has three distinct real roots, determine the value(s) of k .	(2)
		[16]

QUESTION 9																								
9.1	Given : $P(A) = 0,5$ $P(\text{not } B) = 0,45$ $P(A \text{ or } B) = 0,9$																							
	Stanmorephysics.com																							
	Draw a Venn-diagram and complete all the relevant information.			(4)																				
9.2	<table border="1"><thead><tr><th></th><th colspan="2">Gender</th><th></th></tr><tr><th>Color of hair</th><th>Men</th><th>Women</th><th>Total</th></tr></thead><tbody><tr><td>Brown</td><td>40</td><td>60</td><td>100</td></tr><tr><td>Red</td><td>8</td><td>7</td><td>15</td></tr><tr><td></td><td>48</td><td>67</td><td>115</td></tr></tbody></table> Is the red hair colour dependent of gender?				Gender			Color of hair	Men	Women	Total	Brown	40	60	100	Red	8	7	15		48	67	115	(4)
	Gender																							
Color of hair	Men	Women	Total																					
Brown	40	60	100																					
Red	8	7	15																					
	48	67	115																					
9.3	In a factory, three machines, A, B and C, are used to manufacture plastic bottles. They produce 22%, 33% and 45% respectively of the total production. 2%, 3% and 7% respectively of the plastic bottles produced by machines A, B and C are defective.																							
9.3.1	Represent the information by means of a tree diagram. Clearly indicate the probability associated with each branch of the tree diagram and write down all the outcomes.			(4)																				
9.3.2	A plastic bottle is selected at random from the total production.																							
	(a)	What is the probability that it was produced by machine B and it is not defective?		(2)																				
	(b)	What is the probability that the bottle is defective?		(2)																				
				[16]																				

TOTAL MARKS: 150

INFORMATION SHEET

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

$$A = P(1 + in) \quad A = P(1 - in)$$

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

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

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

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

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

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

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

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

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

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

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

$$y = mx + c \quad y - y_1 = m(x - x_1)$$

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

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

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

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

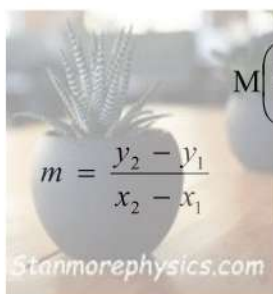
$$\cos(\alpha - \beta) = \cos \alpha \cos \beta + \sin \alpha \sin \beta$$

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

$$\bar{x} = \frac{\sum x}{n}$$

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

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



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

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

$$m = \tan \theta$$

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

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

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

$$\sin 2A = 2 \sin A \cos A$$

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

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

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



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**NATIONAL
SENIOR CERTIFICATE
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GRADE 12/GRAAD 12

MATHEMATICS P1/WISKUNDE V1
MARKING GUIDELINE/NASIENRIGLYN
JUNE 2026

MARKS/PUNTE: 150

The marking guideline consists of 14 pages/Die nasienriglyn bestaan uit 14 bladsye.

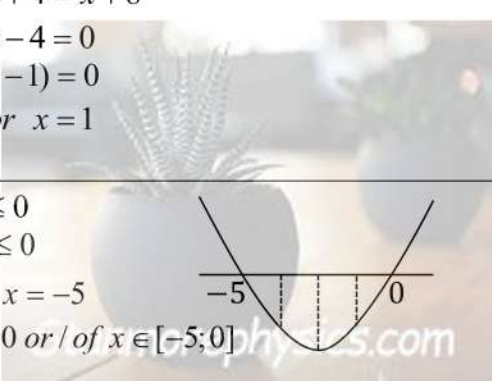
TAKE NOTE:

- If a candidate answered a question TWICE, mark only the FIRST attempt.
- If a candidate crossed out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking guidelines.
- Assuming values/answers in order to solve a problem is unacceptable.

LET WEL:

- As 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.
- As 'n kandidaat 'n antwoord deurgehaal en nie oorgedoen het nie, sien die deurgehaalde antwoord na.
- Volgehoue akkuraatheid is op ALLE aspekte van die nasienriglyn van toepassing.
- Dit is onaanvaarbaar om waardes/antwoorde te veronderstel om 'n probleem op te los.

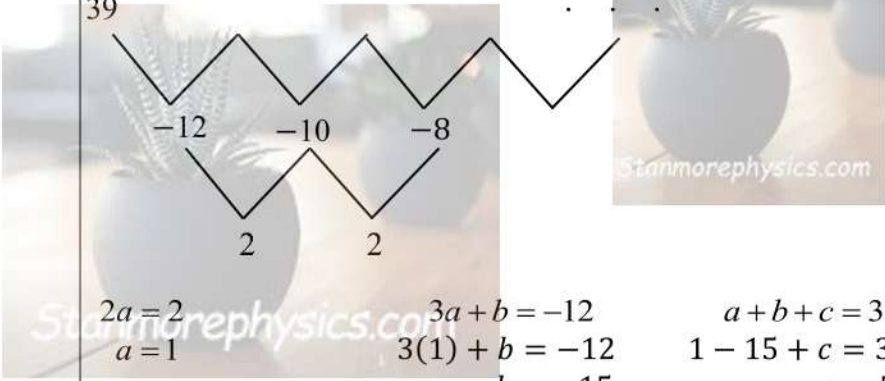
QUESTION 1/VRAAG 1

1.1.1	$\left(\frac{3x}{2} + 5\right)(x^2 - 7) = 0$ a) $x = -\frac{10}{3}$ b) $x = \pm\sqrt{7}$	 ✓ $x = -\frac{10}{3}$ ✓ $x = \pm\sqrt{7}$ (2)
1.1.2	$-4x^2 + 6x = 1 \quad (\text{Correct to 2 decimal places})$ $-4x^2 + 6x - 1 = 0 \quad \text{or} \quad 4x^2 - 6x + 1 = 0$ $x = \frac{-6 \pm \sqrt{6^2 - 4(-4)(-1)}}{2(-4)} \quad \text{or} \quad x = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(4)(1)}}{2(4)}$ $x = 0,19 \quad \text{or} \quad x = 1,31$	✓ standard form / standaardvorm ✓ substitution into quadratic formula / vervanging in kwadratiese formule ✓✓ answers / antwoorde (4)
1.1.3	$x - \sqrt{x+8} = -2$ $x + 2 = \sqrt{x+8}$ $x^2 + 4x + 4 = x + 8$ $x^2 + 3x - 4 = 0$ $(x+4)(x-1) = 0$ $x \neq -4 \quad \text{or} \quad x = 1$	✓ isolate surd / isoleer wortel ✓ square both sides / kwadreer albei kante ✓ value of 4 with rejection / waarde van 4 met verwerping ✓ $x = 1$ (4)
1.1.4	$x^2 + 5x \leq 0$ $x(x+5) \leq 0$ $x = 0 \quad \text{or} \quad x = -5$ $-5 \leq x \leq 0 \quad \text{or / of} \quad x \in [-5; 0]$	 ✓ critical values / kritieke waardes ✓✓ $-5 \leq x \leq 0$ or / of $x \in [-5; 0]$ one interval with correct notation / een interval met korrekte notasie (3)

1.1.5	$3 \cdot 2^{x+1} + 2^{2x} = 40$ $2^{2x} + 6 \cdot 2^x - 40 = 0 \quad \text{or} \quad k^2 + 6k - 40 = 0$ $(2^x + 10)(2^x - 4) = 0 \quad (k + 10)(k - 4) = 0$ $2^x = -10 \text{ or } 2^x = 4 \quad k = -10 \text{ or } k = 4$ No sol/geen opl or $x = 2$	✓ standard form/standaardvorm ✓ factors/faktore ✓ No sol / geen opl ✓ $x = 2$ (4)
1.2	$3^{x+2y} = \frac{(3^2)^{3y}}{3^3}$ $3^{x+2y} = 3^{6y-3}$ $x + 2y = 6y - 3$ $x = 4y - 3 \quad \dots(1)$ $(4y - 3)^2 - 10y^2 + 6y + 3 = 0$ $16y^2 - 24y + 9 - 10y^2 + 6y + 3 = 0$ $6y^2 - 18y + 12 = 0$ $y^2 - 3y + 2 = 0$ $(y - 1)(y - 2) = 0$ $y = 1 \text{ or } y = 2$ $x = 4(1) - 3 \text{ or } x = 4(2) - 3$ $= 1 \quad = 5$ OR/OF $3^{x+2y} = \frac{(3^2)^{3y}}{3^3}$ $3^{x+2y} = 3^{6y-3}$ $x + 2y = 6y - 3$ $y = \frac{x+3}{4}$ $x^2 - 10\left(\frac{x+3}{4}\right)^2 + 6\left(\frac{x+3}{4}\right) + 3 = 0$ $x^2 - 10\left(\frac{x^2 + 6x + 9}{16}\right) + 6\left(\frac{x+3}{4}\right) + 3 = 0$ $8x^2 - 5x^2 - 30x - 45 + 12x + 36 + 24 = 0$ $3x^2 - 18x + 15 = 0$ $x^2 - 6x + 5 = 0$ $(x - 1)(x - 5) = 0$ $x = 1 \text{ or } x = 5$ $y = 1 \text{ or } y = 2$	✓ exponential equation / eksponensiële vergelyking ✓ equating exponents / stel eksponente gelyk ✓ substitution into 2nd eq. / vervang in 2e vgl ✓ standard form / standaardvorm ✓ both y-values/ beide y-waardes ✓ both x-values/ beide x-waardes (6) ✓ exponential equation / eksponensiële vergelyking ✓ equating exponents / stel eksponente gelyk ✓ substitution into 2nd eq. / vervang in 2e vgl ✓ standard form / standaardvorm ✓ both x-values/ beide x-waardes ✓ both y-values/ beide y-waardes

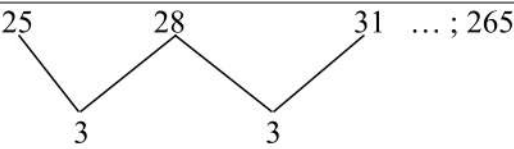
1.3	$2p + 1 \geq 0$ and a perfect square / en 'n volkome vierkant $p \geq -\frac{1}{2}$ $p = \frac{3}{2}$ or $p = 4$ or $p = \frac{15}{2}$ or $p = 12 \dots$	✓ inequality / ongelykheid ✓✓ any two valid values / enige 2 geldige waardes (3)
1.4	$Circumf(Omtrek) = 2\pi r = 10\pi$ $r = 5cm$ $SurfaceArea(Buite - opp) = 2\pi r^2 + 2\pi rh = 90\pi$ $2\pi(5)^2 + 2\pi(5)h = 90\pi$ $40\pi + 10\pi h = 90\pi$ $h = 4cm$	✓ value of r/r waardes ✓ Subst into correct formula / vervang in regte formule ✓ h (3)
		[29]

QUESTION 2/VRAAG 2

2.1.1	 $2a = 2$ $a = 1$ $3a + b = -12$ $3(1) + b = -12$ $b = -15$ $a + b + c = 39$ $1 - 15 + c = 39$ $c = 53$ $\therefore T_n = n^2 - 15n + 53$	✓ $a = 1$ ✓ $b = -15$ ✓ $c = 53$ OR 3 marks for answer only OF 3 punte vir slegs antwoord (3)
2.1.2	$n = -\frac{b}{2a}$ or $2n - 15 = 0$ $= -\frac{-15}{2(1)}$ $= 7,5$ The value of n cannot be a fraction, therefore terms 7 and 8 will both be the minima. There will be no one minimum term. Die waarde van n kan nie 'n breuk wees nie, daarom sal terme 7 en 8 beide die minima wees. Daar sal dus nie net een minimum wees nie.	✓ $n = 7,5$ ✓ No with explanation / Nee met verklaring (2)

2.2.1	$\sum_{n=0}^{\infty} \left(\frac{3+x}{3} \right)^n = 1 + \frac{3+x}{3} + \left(\frac{3+x}{3} \right)^2$ $a = 1 \text{ and } r = \frac{3+x}{3}$ $S_{\infty} = \frac{1}{1 - \frac{3+x}{3}}$	✓✓ substitution of a and r into correct equation / vervanging van a en r in korrekte formule. (2)
2.2.2	$-1 < \frac{3+x}{3} < 1$ $-3 < 3+x < 3$ $-6 < 3+x < 0$	✓ $-1 < r < 1$ ✓✓ Endpoints with correct notation / eindpunte met korrekte notasie (3)
2.2.3	$S_{\infty} = \frac{1}{1 - \frac{3+(-2)}{3}}$ $= \frac{3}{2}$	✓ answer / antwoord (1)
[11]		

QUESTION 3/VRAAG 3

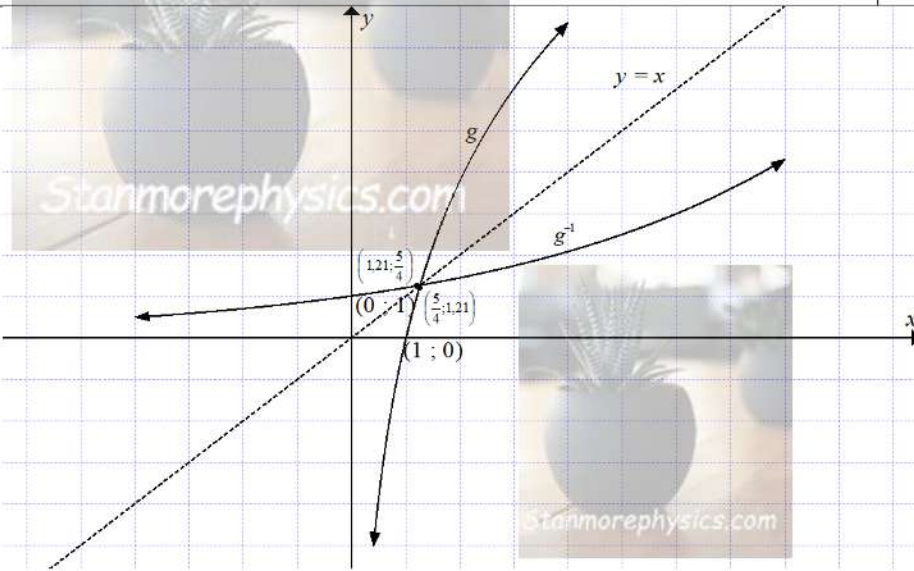
3.1.1	 $265 = 25 + (n-1)(3)$ $265 = 25 + 3n - 3$ $= 3n + 22$ $243 = 3n$ $n = 81$	✓ substitute into correct formule / vervang in korrekte formule ✓ $n = 81$ (2)
3.1.2	$\sum_{n=1}^{81} (3n + 22)$	✓ $(3n + 22)$ ✓ $\sum_{n=1}^{81}$ (2)
3.1.3	$S_n = \frac{n}{2} [2(25) + (n-1)(3)] > 15000$ $n(50 + 3n - 3) > 30000$ $3n^2 + 47n - 30000 > 0$ $n = \frac{-47 \pm \sqrt{47^2 - 4(3)(-30000)}}{6}$	✓ substitution of a and d into correct sum formula / vervanging van a en d in korrekte som-formule ✓ $> 15\,000$

	$n = 92,47$ or $n = -108,13$ $\therefore 93 - 81 = 12$ terms must be added / 12 terme moet bygetel word.	✓ answers for n / antwoorde vir n ✓ 12 (4)
3.2	Area of /opp van $\Delta 1 = \frac{1}{2} \times 8 \times 10 = 40 \text{ cm}^2 = a$ Area of /opp van $\Delta 2 = \frac{1}{2} \times 4 \times 5 = 10 \text{ cm}^2$ $r = \frac{1}{4}$ $S_8 = \frac{40 \cdot \left[\left(\frac{1}{4} \right)^8 - 1 \right]}{\frac{1}{4} - 1}$ $= 53,333 \text{ cm}^2$	✓ $a = 40$ ✓ r ✓ answer / antwoord (3)
		[11]

QUESTION 4/VRAAG 4

Remember to apply CA through the whole question where applicable

4.1	$\frac{4}{9} = a^2 - 1$ $\frac{13}{9} = a^2$ $\frac{\sqrt{13}}{3} = a$	✓ substitution / substitusie ✓ answer (2)
4.2	$y \in (-1; \infty)$ or $y > -1$	✓ answer / antwoord (1)
4.3	$\frac{5}{4} = \left(\frac{\sqrt{13}}{3} \right)^x - 1$ $\frac{9}{4} = \left(\frac{\sqrt{13}}{3} \right)^x$ $x = \log_{\frac{\sqrt{13}}{3}} \left(\frac{9}{4} \right)$ $x = 4,41$ $C \left(\frac{5}{4}; 4,41 \right)$	✓ method / metode ✓ x -value ✓ answer (3)
4.4	No, because $y = x$ is not a symmetry axis of f , Nee want $y = x$ is nie 'n simmetrie-as van f nie. OR / OF $\left(\frac{\sqrt{13}}{3} \right)^x - 1 = 0,26$ That is not equal to 4,41. $\therefore C'$ is not on f .	✓ No / nee ✓ explanation/verduideliking (2)

	Dit is nie gelyk aan -2 nie, $\therefore$ is C' nie op f nie.	
4.5	$g(x) = \left(\frac{\sqrt{13}}{3}\right)^x$ OR $g(x) = (1,2)^x$.	✓ answer / antwoord (1)
4.6	$x = \left(\frac{\sqrt{13}}{3}\right)^y$ OR $x = (1,2)^y$ $g^{-1}(x) = \log_{\frac{\sqrt{13}}{3}} x$ OR $y = \log_{(1,2)} x$	✓interchanging x and y / ruil x en y om ✓answer / antwoord answer only, full mark Slegs antwoord, volpunte (2)
4.7		✓ g with y -intercept of 1 / g met y -afsnit by 1 ✓ g^{-1} with x -intercept at 1 / g^{-1} met x -afsnit by 1 ✓ line/lyn $y = x$ ✓ any point on g / enige punt op g ✓ any point on g^{-1} / enige punt op g^{-1} (5)
4.8	$0 < x < 1$ OR $x \in (0;1)$	✓ answer / antwoord (1)
		[17]

QUESTION 5 / VRAAG 5

5.1	$5 = a(1-2)^2 + 3$ $a = 2$ $g(x) = 2(x-2)^2 + 3$	✓ substitution / substitusie ✓ $a = 2$ ✓ equation (3)
5.2	$5 = \frac{k}{1-2} + 3$ $2 = \frac{k}{-1}$ $k = -2$	✓ substitution / vervanging (1)
5.3	A (0 ; 11) For /vir B:	✓ point A / punt A ✓ subst / vervang $y = 0$

	$0 = \frac{-2}{x-2} + 3$ $-3 = \frac{-2}{x-2}$ $-3x + 6 = -2$ $x = \frac{8}{3}$ $AB^2 = \left(\frac{8}{3}\right)^2 + (11)^2$ $AB = 11,32 \text{ units/eenhede}$	✓ x-coordinate of B / x-koördinaat van B ✓ answer / Antwoord (4)
5.4	$y = -(x-2) + 3$ $y = -x + 5$	✓✓ answer / antwoord (2)
5.5	$f(x) \leq g(x)$ $x \leq 1 \text{ or } x > 2, x \neq 3$	✓ $x \leq 1$ ✓ $x > 2, x \neq 3$ (2)
5.6	$m < -3$	✓✓ answer / antwoord (2)
5.7	$h(x) = 2(x-4)^2 + 1$	✓ 2 ✓ $(x-4)^2 + 1$ (2)
		[16]

QUESTION 6 / VRAAG 6

6.1	$i_{eff} + 1 = \left(1 + \frac{i_{nom}}{m}\right)^m$ $i_{eff} + 1 = \left(1 + \frac{0,07}{4}\right)^4$ $i_{eff} = 0,071859...$ $r = 7,19\%$	✓ substitution in correct formula / vervanging in korrekte formule ✓ simplification / vereenvoudiging ✓ answer/antwoord (3)
6.2	$A = P(1-i)^n$ $453\,672,30 = 790\,000(1-i)^5$ $\sqrt[5]{0,57426} = 1-i$	✓✓ substitution into correct formula / vervanging in korrekte formule

	$-0,105000 = -i$ $r = 10,5\%$	✓ answer / antwoord (3)
6.3	$A = 15\,000 \left(1 + \frac{0,091}{12}\right)^{36} \left(1 + \frac{0,085}{2}\right)^8 - 3\,000 \left(1 + \frac{0,091}{12}\right)^{12} \left(1 + \frac{0,085}{2}\right)^8$ $= R22\,884,74$ Interest received / rente ontvang = R7 884,74	$\checkmark \left(1 + \frac{0,091}{12}\right)^{36}$ $\checkmark \left(1 + \frac{0,085}{2}\right)^8$ $\checkmark -3\,000 \left(1 + \frac{0,091}{12}\right)^{12}$ $\checkmark \left(1 + \frac{0,085}{2}\right)^8$ $\checkmark R22\,884,74 \checkmark$ $R7\,884,74 \quad (6)$
6.4	$A = P(1 + i.n)$ $2x = x(1 + 0,0795 \cdot n)$ $n = 12,5786\dots$ $= 12 \text{ years and 7 months} / 12 \text{ jaar en 7 maande}$	$\checkmark \text{ subst in correct formula / vervanging in korrekte formule}$ $\checkmark 12,5786\dots$ $\checkmark 12 \text{ years 7 months}$ $12 \text{ jaar 7 maande} \quad (3)$
		[15]

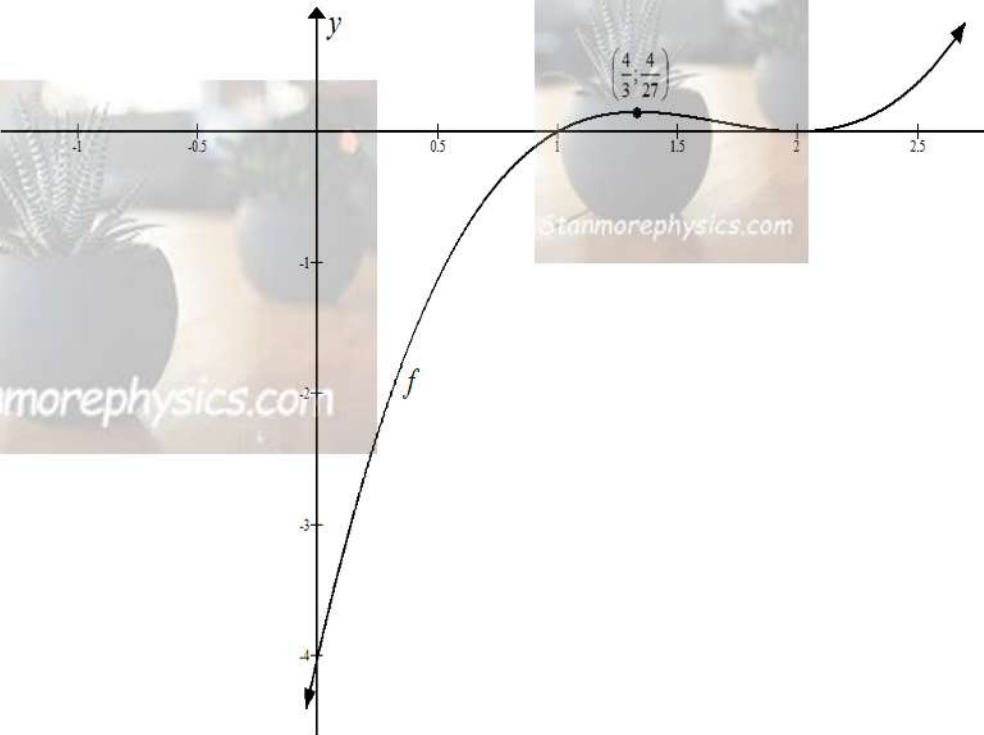
QUESTION 7 / VRAAG 7

7.1	$f(x) = -4x^2 - 3$ $f(x+h) = -4(x+h)^2 - 3$ $= -4x^2 - 8xh - 4h^2 - 3$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$	$\checkmark f(x+h)$ $\checkmark$ substitution/vervanging in f' $\checkmark \text{ simplification / vereenvoudiging}$ $\checkmark \text{ factorise / faktorisier}$
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	$= \lim_{h \rightarrow 0} \frac{-4x^2 - 8xh - 4h^2 - 3 - (-4x^2 - 3)}{h}$ $= \lim_{h \rightarrow 0} \frac{-8xh - 4h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-8x - 4h)}{h}$ $= \lim_{h \rightarrow 0} (-8x - 4h)$ $= -8x$	✓ answer / antwoord (5)
7.2.1	$D_x [-(2x-1)^2]$ $= D_x [-(4x^2 - 4x + 1)]$ $= D_x [-4x^2 + 4x - 1]$ $= -8x + 4$	✓ $-4x^2 + 4x - 1$ ✓ $-8x$ ✓ $+4$ (3)
7.2.2	$\frac{d}{dx} \left[\frac{1 - \sqrt[3]{x^2} + \pi x}{6x} \right]$ $= \frac{d}{dx} \left[\frac{x^{-1}}{6} - \frac{x^{\frac{2}{3}}}{6x} + \frac{\pi}{6} \right]$ $= \frac{d}{dx} \left[\frac{x^{-1}}{6} - \frac{x^{-\frac{1}{3}}}{6} + \frac{\pi}{6} \right]$ $= -\frac{x^{-2}}{6} + \frac{1}{3} \left(\frac{x^{-\frac{4}{3}}}{6} \right) + 0 = -\frac{x^{-2}}{6} + \frac{x^{-\frac{4}{3}}}{18}$	✓ $\frac{x^{-1}}{6}$ ✓ $-\frac{x^{-\frac{1}{3}}}{6}$ ✓ $\frac{\pi}{6}$ ✓ $-\frac{x^{-2}}{6}$ ✓ $+\frac{x^{-\frac{4}{3}}}{18}$ ✓ 0 (6)
7.2.3	$g(x) = \frac{x^3 - 8}{x - 2} = \frac{(x - 2)(x^2 + 2x + 4)}{x - 2}$ $= x^2 + 2x + 4$ $g'(x) = 2x + 2$	✓ factorisation / faktoriserings ✓ $2x + 2$ (2)
7.3	$p'(x) = -12x^2 + 2x$ $p''(x) = -24x + 2 > 0$ $x < \frac{1}{12} \quad \text{OR} \quad x \in \left(-\infty; \frac{1}{12}\right)$	✓ $p'(x)$ ✓ $p''(x)$ ✓ answer / antwoord (3)
		[19]

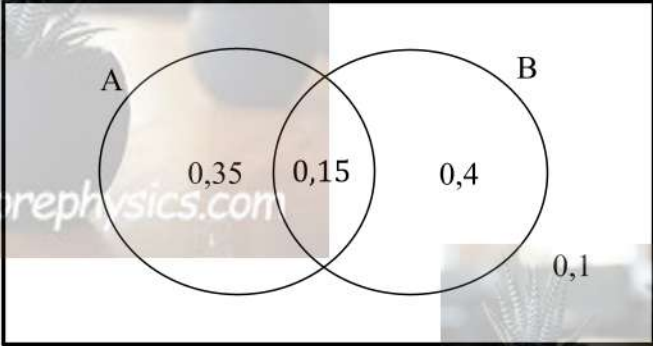
QUESTION 8 / VRAAG 8

8.1	$f(x) = x^3 - 5x^2 + 8x - 4$ $= (x - 1)(x^2 - 4x + 4)$	✓ $f'(x)$ ✓ $f'(x) = 0$
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	$f'(x) = 3x^2 - 10x + 8 = 0$ $(3x - 4)(x - 2) = 0$ $x = \frac{4}{3} \text{ or } x = 2$ $y = \left(\frac{4}{3}\right)^3 - 5\left(\frac{4}{3}\right)^2 + 8\left(\frac{4}{3}\right) - 4 \text{ or } y = (2)^3 - 5(2)^2 + 8(2) - 4$ $= \frac{4}{27} \qquad \qquad \qquad = 0$ $\text{TP's / DPe: } \left(\frac{4}{3}; \frac{4}{27}\right) \text{ and } (2; 0)$	✓ x - values / x - waardes ✓ y - values / y - waardes (4)
8.2	$(x - 1)(x^2 - 4x + 4)$ $= (x - 1)(x - 2)(x - 2)$ $(1; 0) \text{ and } (2; 0)$	✓ $(1; 0)$ ✓ $(2; 0)$ (2)
8.3		✓ x- and/en y-intercepts / afsnitte ✓ TP's / DPe ✓ shape (3)
8.4	$x \leq 1 \text{ or } x = 2$	✓ $x \leq 1$ ✓ $x = 2$ (2)
8.5	$f(3) = (3)^3 - 5(3)^2 + 8(3) - 4$ $= 2$ $f'(3) = 3(3)^2 - 10(3) + 8$ $= 5 = m$	✓ $f(3) = 2$ ✓ $f'(3) = 5$

	$y - 2 = 5(x - 3)$ $y = 5x - 13$	✓ equation / vergelyking (3)
8.6	$k \in \left(0; \frac{4}{27}\right)$ or $0 < k < \frac{4}{27}$	✓ values / waardes ✓ notation / notasie (2)
		[16]

QUESTION 9 / VRAAG 9

9.1		✓ 0,35 ✓ 0,15 ✓ 0,4 ✓ 0,1 (4)
9.2	$P(\text{Red} / \text{Rooi}) = \frac{15}{115} = \frac{3}{23}$ $P(\text{Women} / \text{Vrouens}) = \frac{67}{115}$ $P(\text{Red and Women} / \text{Rooi en Vrouens}) = \frac{7}{115} = 0,061$ $P(\text{Red} / \text{Rooi}) \times P(\text{Women} / \text{Vrouens}) = \frac{15}{115} \times \frac{67}{115} = \frac{201}{2645} = 0,076$ $\therefore P(\text{Red}) \times P(\text{Women}) \neq P(\text{Red and Women})$ $\therefore P(\text{Rooi}) \times P(\text{Vrouens}) \neq P(\text{Rooi en Vrouens})$ $\therefore$ The hair colour is dependent on gender / Haarkleur is afhanklik van geslag. OR/OF $P(\text{Red} / \text{Rooi}) = \frac{15}{115} = \frac{3}{23}$ $P(\text{Men} / \text{Mans}) = \frac{48}{115}$ $P(\text{Red and Men} / \text{Rooi en Mans}) = \frac{8}{115} = 0,06956$ $P(\text{Red} / \text{Rooi}) \times P(\text{Men} / \text{Mans}) = \frac{15}{115} \times \frac{48}{115} = \frac{144}{2645} = 0,05444$ $P(\text{Red}) \times P(\text{Men}) \neq P(\text{Red and Men})$ $P(\text{Rooi}) \times P(\text{Mans}) \neq P(\text{Rooi en Mans})$ $\therefore$ The hair colour is dependent on gender / Haarkleur is afhanklik van geslag.	✓ P(Red/Rooi) ✓ P(Women/Vrouens) ✓ P(Red/Rooi) $\times$ P(Women/Vrouens) ✓ equation with conclusion / vergelyking met gevolgtrekking (4) ✓ P(Red/Rooi) ✓ P(Men/Mans) ✓ P(Red/Rooi) $\times$ P(Men/Mans) ✓ equation with conclusion / vergelyking met gevolgtrekking

9.3.1		✓ 1st branching with probabilities / 1e vertakking met waarskynlikhede ✓ 2nd branching with probabilities / 2e vertakking met waarskynlikhede ✓ 3rd branching with probabilities / 3e vertakking met waarskynlikhede ✓ 4th branching with probabilities / 4 vertakking met waarskynlikhede (4)
9.3.2(a)	$P(B \text{ and } /en ND) = 33\% \times 97\% = 0,3201$	✓ multiplication / vermenigvuldiging ✓ answer/antwoord (2)
9.3.2(b)	$P(D) = (22\% \times 2\%) + (33\% \times 3\%) + (45\% \times 7\%)$ $= 0,0458$	✓ products / produk ✓ answer / antwoord (2)
		[16]

TOTAL/TOTAAL: 150