education
MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P1

SEPTEMBER 2026

MARKS: 150

TIME: 3 HOURS

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

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 in the answer 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. Write neatly and legibly.

QUESTION 1

1.1 Solve for x if:

1.1.1 $2x(x-1)+5(x-1)=0$ (2)

1.1.2 $-4x-3x^2=-5$ Correct to 2 decimal places. (4)

1.1.3 $9^x-3^x=6$ (4)

1.1.4 $\sqrt[3]{32}=8^{3x}.2^{6x}$ (3)

1.1.5 $-(x+2)(x-3)\leq 0$ (3)

1.2 Solve for x and y simultaneously:

$y-2=(x-2)^2$ (5)
$y-x=2$

1.3 Prove that the roots of $3x^2+2kx-k=2x$ are never equal, for any real number k. (4)

1.4 Determine the value of: $\dfrac{5^{2006}-5^{2004}+24}{5^{2004}+1}$ (3)

[28]

QUESTION 2

2.1 Given the finite arithmetic sequence: $-2\,;2\,;6\,;10\,;\ldots;262$

2.1.1 Write down the fifth term of the sequence. (1)

2.1.2 Determine the formula for the general term of the sequence. (2)

2.1.3 Determine the sum of all the terms in the above sequence. (4)

2.2 Consider the quadratic sequence $m\,;5\,;n\,;19$.

2.2.1 Calculate the values of m *and* n if the second difference is 2 (4)

2.2.2 Hence determine the n^{th}-term of the quadratic sequence. (3)

[14]

QUESTION 3

3.1 Given $\sum_{k=3}^{19}(-2)^k$

3.1.1 Write down the value of the constant ratio. (1)

3.1.2 Will $\sum_{k=3}^{19}(-2)^k$ converge? Explain your answer. (2)

3.1.3 Evaluate $\sum_{k=3}^{21}(-2)^k x$ in terms of x. (3)

3.2 Shoba's annual salary is 150 000 and her expenses total R105 000.Her salary increases by R13 500 each year while her expenses increase by R17 000 each year. Each year she saves the excess of her income.

3.2.1 Represent her total savings as a series. (4)

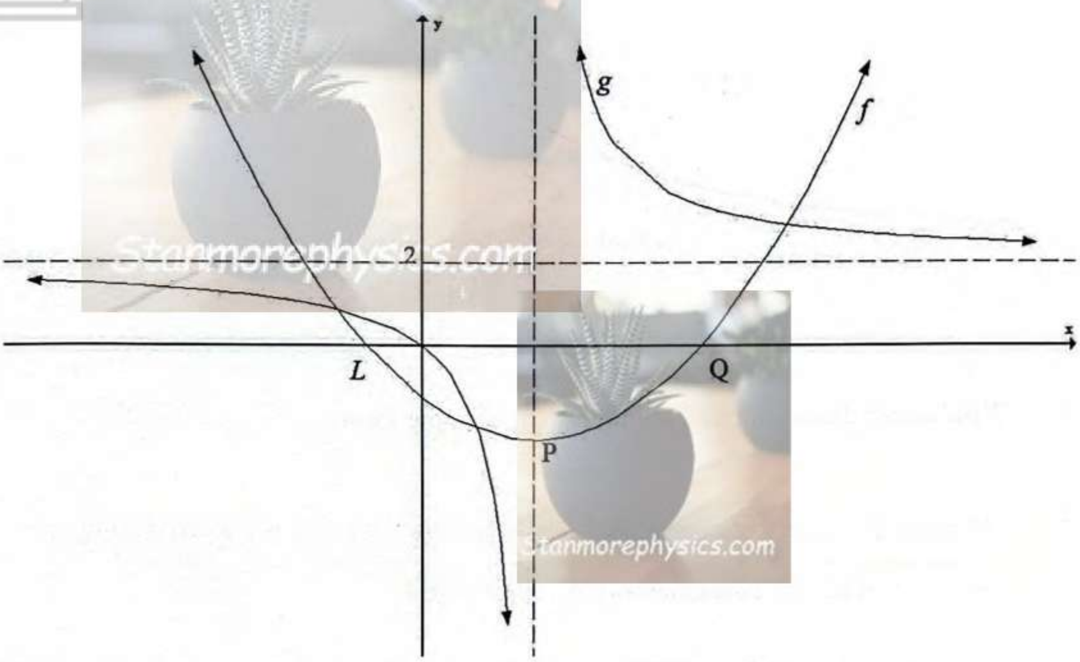
3.2.2 If she continues to manage her finances this way, after how many years will she have nothing left to save? (3)

[13]

QUESTION 4

Sketched below are the graphs of $f(x)=(x-p)^2+q$ and $g(x)=\dfrac{a}{x-b}+c$.

$Q(\frac{5}{2};0)$ is a point on the graph of f. P $(1;y)$ is the turning point of f. The asymptotes of g are represented by the dotted lines. The horizontal asymptote intersects the y – axis at 2. The graph of g passes through the origin.

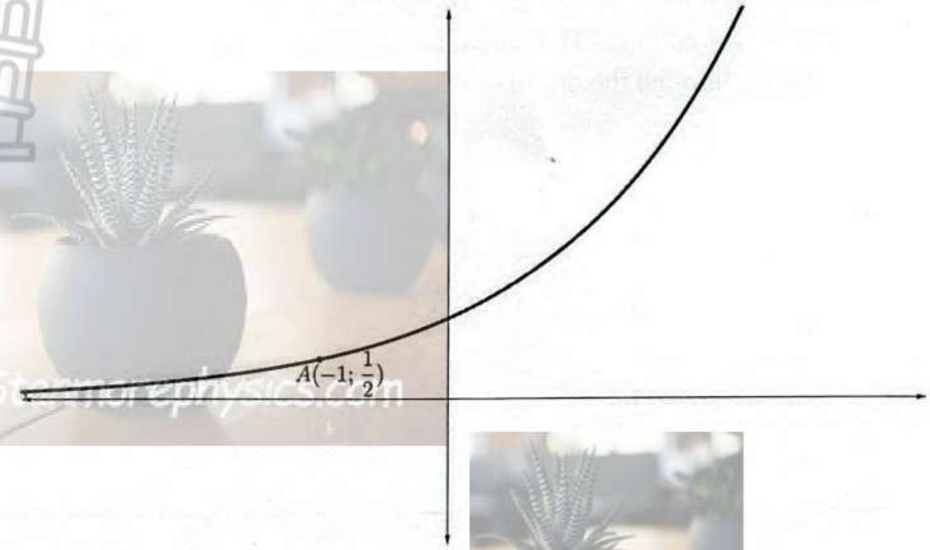


4.1	Determine the equation of g.	(4)
4.2	Determine the y-coordinate of P, the turning point of f.	(2)
4.3	Write down the equations of the asymptotes of $g(x-1)-3$.	(2)
4.4	If L is the other x - intercept of f, calculate the length of LQ.	(2)
4.5	Write down the equation of h if h is the reflection of f in the x-axis.	(1)
4.6	For which values of x is $g(x)>0$?	(2)

[13]

QUESTION 5

Consider the graph of the function $f(x) = 2^x$ below



5.1 Write down the equation of the inverse of f in the form $y = ...$ (2)

5.2 The point $A\left(-1;\frac{1}{2}\right)$ is a point on the graph. If this function is reflected along the line $y = x$, write the coordinates of A', the image A . (1)

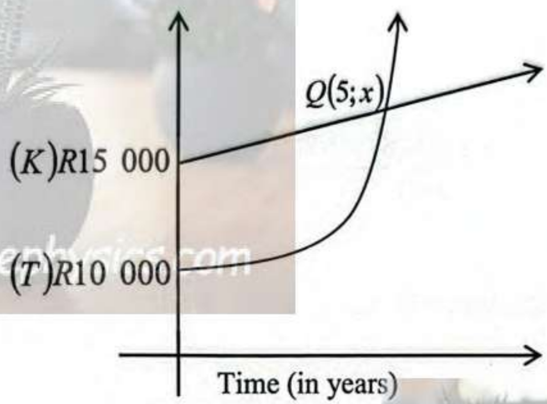
5.3 Draw the graph of the inverse of f on the same system of axes. Include the coordinates of one point on the graph, other than an intercept with the axes, as well as the symmetry-axis. (4)

5.4 Determine the point of intersection of the graph of f and $g(x) = \left(\frac{1}{2}\right)^{x-1}$ (4)

[11]

QUESTION 6

6.1 A company buys two different assets, T and K which are both increasing in value in exponential and linear form respectively, as shown in the diagram below. Point Q is a point of intersection of the two functions. The linear increase is at a rate of 7,5% p.a.



6.1.1 Calculate the value of x. (2)

6.1.2 Hence, calculate the annual interest rate for asset T. (4)

6.2 After 5 years, both assets in 6.1 (K and T) are traded in for new machinery of a value of R70 000. A sinking fund is set-up at the time the two assets are bought for the balance of a new machine.

6.2.1 How much is the total trade-in value? (1)

6.2.2 Calculate the value of the sinking fund , after the 2 assets were traded in. (1)

6.2.3 If the sinking fund is set-up at 11% p.a. compounded monthly for 5 years, calculate the value of the regular payments. (4)

6.3 A loan of R15 000 is taken out at 13% p.a., compounded monthly. If monthly repayments of R588,32 are made for 2,5 years to repay the loan, calculate the outstanding balance after 1 year. (3)

[15]

QUESTION 7

7.1 If $f(x) = -\pi x^2$, determine $f'(x)$ from the first principles. (5)

7.2 Determine $\frac{dy}{dx}$ if $y = \left(1 - \sqrt{x}\right)^2$ (3)

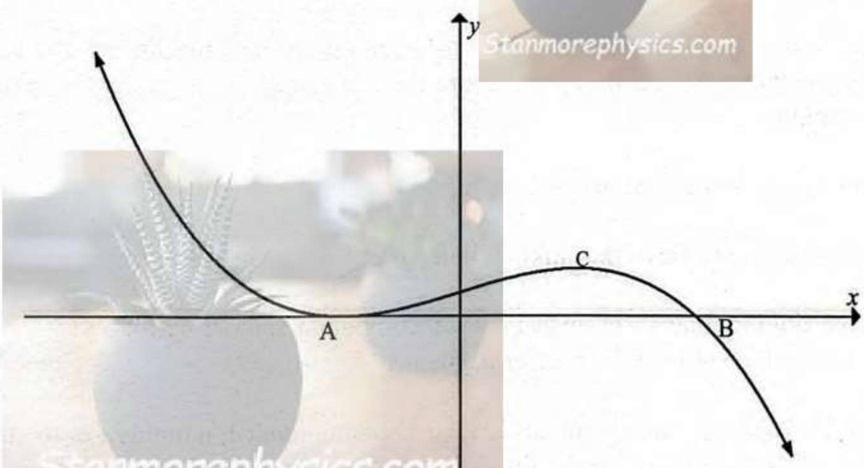
7.3 Determine $g'(x)$ if $g(x) = \frac{x\left(x^2 - 100\right) - x^2 + 100}{x - 1}$ (4)

7.4 If $h(x) = 7 - \frac{2}{x^3}$, calculate the value of $h'(2) + 4$. (3)

[15]

QUESTION 8

The graph below represent the function $f(x) = -x^3 + dx + q$ with $A(-1;0)$ and $B(2;0)$.



8.1 Show that $d = 3$ and $q = 2$. (3)

8.2 Determine the coordinates of turning point C. (4)

8.3 If $f'(x) = -9, x > 0$, determine the coordinates of the point of tangency. (3)

8.4 If $g(x) = f(x-3)$, determine the coordinates of C', the maximum turning point of g. (1)

8.5 Use the graph to solve for x if $f'(x).f(x) < 0$ (2)

8.6 For which values of k will $-x^3 + 3x + 2 = k$ have one root only? (2)

[15]

QUESTION 9

Two Bikers start to cycle at the same time. One starts at point B and is heading due south to point A, whilst the other starts at point D and is heading due west to point B. The biker starting from B cycles at 20 km/h while the biker starting from D cycles at 35 km/h. The distance between B and D is 80 km. After time t (measured in hours), they reach points F and C respectively.

9.1 Prove that the distance between F and C is given by $FC = \sqrt{1625t^2 - 5600t + 6400}$ (4)

9.2 After how long will the two bikers be closest to each other? (4)

9.3 What will the distance between the bikers be at the time determined in QUESTION 9.2? (2)

[10]

QUESTION 10

10.1 Let A and B be two events in a sample space. Suppose that the $P(A) = 0,4$; $P(A \text{ or } B) = 0,7$ and $P(B) = k$.
For what value of k are the two events independent? (4)

10.2 Consider the word WIZARDS.

10.2.1 How many different arrangements are possible if all the letters are used? (2)

10.2.2 How many different arrangements are possible if the letters RDS must follow each other in any order? (3)

10.3 Consider the sample space of integers from 1 to 9.

10.3.1 How many 4-digit codes can be created if:

- The code must be greater than 7000
- The code must be divisible by 2
- Numbers can be repeated. (3)

10.3.2 If numbers can be repeated, what is the probability of forming a 4-digit code which is a multiple of 5? (4)

[16]

TOTAL MARKS: 150

INFORMATION SHEET

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

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

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

$T_n = ar^{n-1}$ $\quad$ $S_n = \frac{a(r^n - 1)}{r - 1};\ r \neq 1$ $\quad$ $S_\infty = \frac{a}{1 - r};\ -1 < r < 1$

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

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

$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$ $\quad$ $\mathrm{M}\left(\frac{x_1 + x_2}{2} ; \frac{y_1 + y_2}{2}\right)$

$y = mx + c$ $\quad$ $y - y_1 = m(x - x_1)$ $\quad$ $m = \frac{y_2 - y_1}{x_2 - x_1}$ $\quad$ $m = \tan\theta$

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

In $\Delta ABC: \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ $\quad$ $a^2 = b^2 + c^2 - 2bc.\cos A$

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

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

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

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

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

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

$P(A) = \frac{n(A)}{n(S)}$ $\quad$ $P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$

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

education
MPUMALANGA PROVINCE
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE
NASIONALE SENIOR SERTIFIKAAT

GRADE 12/GRAAD 12

MATHEMATICS P1/WISKUNDE V1

SEPTEMBER 2026

MARKING GUIDELINE/NASIENRIGLYNE

MARKS/PUNTE: 150

The marking guideline consists of 10 pages/Die nasienriglyn bestaan uit 10 bladsye.

TAKE NOTE:

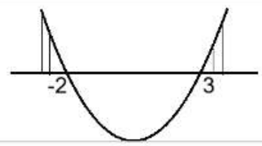
- If a candidate answered a question TWICE, mark only the FIRST attempt.
- If a candidate crossed out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking guidelines.
- Assuming values/answers in order to solve a problem is unacceptable.

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	$(2x+5)(x-1)=0$ $x=-\frac{5}{2}$ or $x=1$	✓✓ answers (2)
1.1.2	$-3x^2-4x+5=0$ $x=\frac{-(-4)\pm\sqrt{(-4)^2-4(-3)(5)}}{2(-3)}$ $x=-2{,}12$ and $x=0{,}79$	✓standard form ✓substitution ✓✓answers (4)
1.1.3	$3^{2x}-3^x-6=0$ $(3^x-3)(3^x+2)=0$ $(3^x-3)=0$ or $(3^x+2)=0$ $3^x=3$ or $3^x\neq-2$ $x=1$ No Sol **OR/OF** Let $3^x=k$ $k^x-k-6=0$ $(k-3)(k+2)=0$ $k=3$ *or* $k=-2$ $3^x=3$ *or* $3^x\neq-2$ $\therefore x=1$	✓breaking to prime factors ✓factoring ✓✓ solutions with rejection (4)
1.1.4	$(2^5)^{\frac{1}{3}}=(2^3)^{3x}.2^{6x}$ $2^{\frac{5}{3}}=2^{9x}.2^{6x}$	✓ exponential form

	$2^{\frac{5}{3}}=2^{15x}$ $\frac{5}{3}=15x$ $x=\frac{1}{9}$	✓ adding exponents ✓ answer (3)
1.1.5	$-(x+2)(x-3)\leq 0$ $x=-2$ and $x=3$ are critical values $x\leq -2$ or $x\geq 3$ 	✓critical values ✓✓ $x\leq -2$ or $x\geq 3$ (3)
1.2	$y=2+x$ $2+x-2=(x-2)^2$ $2+x-2=(x^2-4x+4)$ $x=x^2-4x+4$ $x^2-5x+4=0$ $(x-1)(x-4)=0$ $x=1$ or $x=4$ $y=4+2$ or $y=1+2$ $y=6$ or $y=3$	✓ $y=2+x$ ✓substitution ✓factors ✓both values of x ✓both values of y (5)
1.3	$3x^2+(2k-2)x-k=0$ $\Delta=b^2-4ac$ $=(2k-2)^2-4(3)(-k)$ $=4k^2+4k+4$ $k=\frac{-4\pm\sqrt{(4)^2-4(4)(4)}}{2(4)}$ produces non-real solutions $\therefore$ There's no real value of k for which the discriminant can be equal to zero. Roots are non-real and are never equal.	✓substitution ✓ $=4k^2+4k+4$ ✓ $k=\frac{-4\pm\sqrt{(4)^2-4(4)(4)}}{2(4)}$ ✓ mathematical rational (4)
1.4	$\frac{5^{2006}-5^{2004}+24}{5^{2004}+1}$ $=\frac{5^{2004}(5^2-1)+24}{5^{2004}+1}$ $=\frac{5^{2004}(24)+24}{5^{2004}+1}$ $=\frac{24(5^{2004}+1)}{5^{2004}+1}$ $=24$	✓ common factor/ gemeenskaplike faktor ✓ common factor/ gemeenskaplike faktor ✓ answer/ antwoord (3)
		[28]

QUESTION 2/VRAAG 2

2.1.1	14	✓ answer	(1)
2.1.2	$T_n = a + d(n-1)$ $= -2 + 4(n-1)$ $= 4n - 6$	✓substitution ✓answer	(2)
2.1.3	$262 = 4n - 6$ $n = 67$ $S_n = \frac{67}{2}\left[2(-2) + 4(67-1)\right]$ $= 8\ 710$	✓equating to 262 ✓n-value ✓substitution ✓answer	(4)
2.2.1	$m \quad 5 \quad n \quad 19$ $5-m \quad n-5 \quad 19-n$ $n+m-10=2 \quad -2n+24=2$ $\therefore n = 11 \quad m = 12 - 11 = 1$	✓second difference ✓equating to 2 ✓n-value ✓m- value	(4)
2.2.2	$1 \quad 5 \quad 11 \quad 19$ $4 \quad 6 \quad 8$ $2 \quad 2$ $2a = 2 \qquad 3a + b = 4 \qquad a + b + c = 1$ $a = 1 \qquad b = 1 \qquad c = -1$ $\therefore T_n = n^2 + n - 1$	✓value of **a and b** ✓value of c ✓$T_n = n^2 + n - 1$	(3)
			[14]

QUESTION 3/VRAAG 3		
3.1.1	$r=-2$	✓ answer (1)
3.1.2	No, for convergence $-1<r<1$, this is not the case here.	✓No ✓condition (2)
3.1.3	$n=21-3+1=19$ $S_{19}=\dfrac{-8x\left[(-2)^{19}-1\right]}{-2-1}$ $=-1398104\,x$	✓n- value ✓substitution ✓answer (3)
3.2.1	*TERM* / *INCOME* / *EXPENSES* / *SAVINGS*: 1: *R*150 000, *R*105 000, *R*45 000 2: *R*1635 00, *R*122 000, *R*41500 3: *R*177 000, *R*139 000, *R*38 000 Savings series is $R45\,000 + R41500 + R38\,000 = \ldots + 0$	✓income ✓expenses ✓savings ✓savings series (4)
3.2.2	Income $=150\,000+13\,000(n-1)$ Expenses $=105\,000+17\,000(n-1)$ To be left with nothing means INCOME = EXPENSES $150\,000+13\,000(n-1)=105\,000+17\,000(n-1)$ $\therefore n=13{,}85\,/\,n=14$ years **OR/OF** $0=45\,000-3\,500(n-1)$ $\dfrac{45000}{3500}=n-1$ $\therefore n=13{,}85\,/\,n=14$ years	✓Income and Expenses formulae ✓ equating ✓ answer **OR/OF** ✓ equation ✓ simplification ✓ answer (3)
		[13]

Table in 3.2.1:

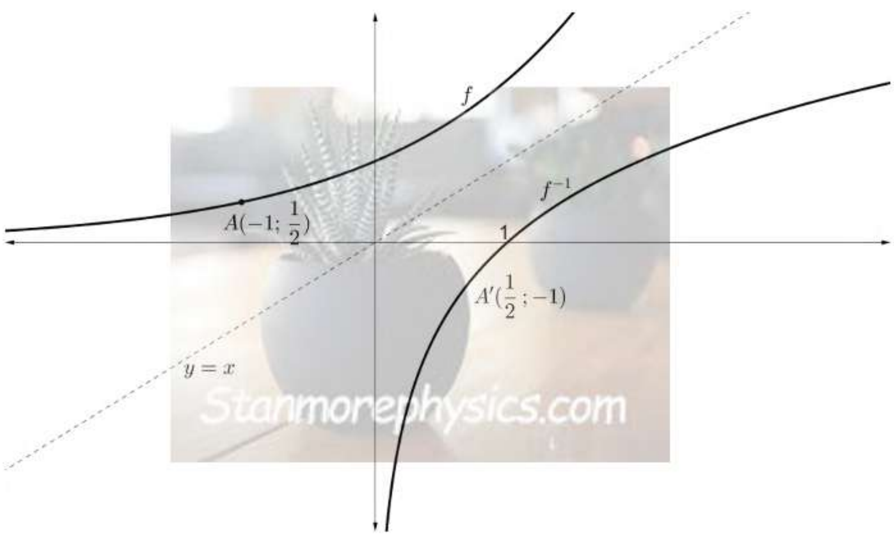
TERM	*INCOME*	*EXPENSES*	*SAVINGS*
1	*R*150 000	*R*105 000	*R*45 000
2	*R*1635 00	*R*122 000	*R*41500
3	*R*177 000	*R*139 000	*R*38 000

QUESTION 4/VRAAG 4

4.1	$y=\dfrac{a}{x-1}+2$ $0=\dfrac{a}{0-1}+2\quad 0=-a+2$ $a=2$ $y=\dfrac{2}{x-1}+2$	✓substitution of asymptotes ✓substituting a point (0; 0) ✓value of *a* ✓ equation (4)
4.2	$0=\left(\dfrac{5}{2}-1\right)^2+q$ $q=-\dfrac{9}{4}$	✓substitution of *x* and *y* ✓ *q*- value (2)

4.3	$x = 2$ $y = -1$	✓ $x = 2$ ✓ $y = -1$ (2)
4.4	$L\left(-\frac{1}{2};0\right)$, Symmetry $LQ = \frac{5}{2} - \left(-\frac{1}{2}\right) = 3\,units$	✓ x-coordinate of L ✓length (2)
4.5	$h(x) = -(x-1)^2 + \frac{9}{4}$	✓answer (1)
4.6	$x \in (-\infty;0) \cup (1;\infty)$ OR /OF $x < 0$ *or* $x > 1$	✓1st Interval ✓2nd Interval (2)
		[13]

QUESTION 5/VRAAG 5

5.1	$x = 2^y$ $\therefore y = \log_2 x$	✓interchanging x & y ✓answer (2)
5.2	$A'\left(\frac{1}{2};-1\right)$	✓ answer
5.3		✓shape ✓ x – intercept ✓ symmetry – axis ✓ another point (4)
5.4	$2^x = \left(\frac{1}{2}\right)^{x-1}$ $2^x = 2^{-x+1}$ $x = -x + 1$ $x = \frac{1}{2}$; $y = \sqrt{2}$	✓ equating ✓ exponential laws ✓ x - coordinate ✓ y - coordinate (4)
		[11]

QUESTION 6/VRAAG 6

6.1.1	$A = P(1+in)$ $x = R15000\,(1+0{,}075\times 5)$ $x = R20625$	✓substitution into linear formula ✓answer (2)
6.1.2	$A = P(1+i)^n$ $R20625 = R10000\,(1+i)^5$ $\dfrac{R20625}{R10000} = (1+i)^5$ $\sqrt[5]{\dfrac{R20625}{R10000}} - 1 = i$ $\therefore i = 15{,}58\%$	✓ substitution of A and P ✓n =5 ✓simplification ✓answer (4)
6.2.1	$R20625\times 2 = R41250$	✓ answer (1)
6.2.2	$R70000 - R41250 = R28750$	✓ answer (1)
6.2.3	$R28750 = \dfrac{x\left[\left(1+\dfrac{0{,}11}{12}\right)^{5\times 12} - 1\right]}{\dfrac{0{,}11}{12}}$ $x = R361.55$	✓substitution into F correctly ✓$i = \frac{0{,}11}{12}$ ✓$n = 60$ ✓answer (4)
6.3.	$OB = \dfrac{588{,}32\left[1-\left(1+\dfrac{0{,}13}{12}\right)^{-1{,}5\times 12}\right]}{\dfrac{0{,}13}{12}}$ $OB = R9574{,}34$ OR $OB = 15000\left(1+\dfrac{0{,}13}{12}\right)^{12} - \dfrac{588{,}32\left[\left(1+\dfrac{0{,}13}{12}\right)^{12} - 1\right]}{\dfrac{0{,}13}{12}}$ $OB = R9574{,}34$	✓substitution ✓ $n = 18$ ✓ answer (3) OR/OF ✓ substitution ✓$n = 12$ ✓answer (3)
		[15]

QUESTION 7/VRAAG 7		
7.1	$f'(x)=\lim_{h\to 0}\frac{f(x+h)\ -f(x)}{h}$ $=\lim_{h\to 0}\frac{-\pi(x+h)^2-(-\pi x^2)}{h}$ $=\lim_{h\to 0}\frac{-\pi(x^2+2xh+h^2)+\pi x^2}{h}$ $=\lim_{h\to 0}\frac{-\pi x^2-2\pi xh-\pi h^2+\pi x^2}{h}$ $=\lim_{h\to 0}\frac{-2\pi xh-\pi h^2}{h}$ $=\lim_{h\to 0}\frac{h(-2\pi x-\pi h)}{h}$ $=\lim_{h\to 0}-2\pi x-\pi h$ $=\ -2\pi x$	✓ substitute $f(x+h)$ ✓ correct substitution into formula and notation ✓ simplification ✓ factorisation ✓ answer (5)
7.2	$y=(1-\sqrt{x})(1-\sqrt{x})$ $=1-2\sqrt{x}+x$ $=1-2x^{\frac{1}{2}}+x$ $\frac{dy}{dx}=-x^{-\frac{1}{2}}+1$	✓expansion ✓writing in exponent form ✓ answer (3)
7.3	$g(x)=\frac{x(x^2-100)-x^2+100}{x-1}$ $=\frac{x(x^2-100)-(x^2-100)}{x-1}$ $=\frac{(x-1)(x^2-100)}{x-1}$ $=x^2-100$ $g'(x)=2x$	✓common negative ✓taking out common bracket ✓ simplification ✓ answer (4)
7.4	$h(x)=7-2x^{-3}$ $h'(x)=6x^{-4}$ $h'(2)+4=6(2)^{-4}+4$ $=\frac{35}{8}$	✓$h'(x)=6x^{-4}$ ✓substitution ✓answer (3)
		[15]

QUESTION 8/VRAAG 8

8.1	$y = a(x - R_1)(x - R_2)(x - R_3)$ $y = -1(x+1)^2(x-2)$ $= -x^3 + 3x + 2$	✓ $a = -1$ ✓ $y = -1(x+1)^2(x-2)$ ✓ expansion (3)
8.2	$f'(x) = 0$ $f'(x) = -3x^2 + 3$ $3x^2 = 3$ $x = \pm 1$ $f(1) = -(1)^3 + 3(1) + 2 = 4$ $C(1;\ 4)$	✓ $f'(x) = 0$ ✓ $f'(x) = -3x^2 + 3$ ✓ x-values ✓ coordinates of C (4)
8.3	$-3x^2 + 3 = -9$ $-3x^2 = -12$ $x = \pm 2$ $-(2)^3 + 3(2) + 2 = 0$ $\therefore$ $(2\ ;\ 0)$ is the point of tangency	✓ $f'(x) = -9$ ✓ substitution of 2 ✓ answer (3)
8.4	$C'(4\ ;\ 4)$	✓ answer (1)
8.5	$x \in (-\infty; -1) \cup (1; 2)$ **OR** $x < -1$ *or* $1 < x < 2$	✓ 1^{st} interval ✓ 2^{nd} interval (2)
8.6	$k \in (-\infty; 0) \cup (4; \infty)$ **OR** $x < 0$ *or* $x > 4$	✓ 1^{st} interval ✓ 2^{nd} interval (2)
		[15]

QUESTION 9/*VRAAG 9*

9.1	After t hours, $BF = 20t$ and $CD = 35t$ $\therefore BC = 80 - 35t$ $FC = \sqrt{(20t)^2 + (80 - 35t)^2}$ $= \sqrt{400t^2 + 6400 - 5600t + 1225t^2}$ $= \sqrt{1625t^2 - 5600t + 6400}$	✓ $BF = 20t$ and $CD = 35t$ ✓ $BC = 80 - 35t$ ✓ substitution ✓ simplification (4)

9.2	**Closest** means minimum distance between the two. FC is minimum if FC^2 is minimum. $FC^2 = 1625t^2 - 5600t + 640$ $\frac{dFC^2}{dt} = 3250t - 5600$ $3250t - 5600 = 0$,for minimum distance $\therefore t = \frac{5600}{3250} = 1{,}72hrs$	✓ $FC^2 = 1625t^2 - 5600t + 640$ ✓ $\frac{dFC^2}{dt}$ ✓equating to 0 ✓answer (4)
9.3	$FC = \sqrt{1625(1.72)^2 - 5600(1.72) + 6400}$ $= 39{,}69km$ apart	✓substitution ✓answer (2)
		[10]

QUESTION 10/*VRAAG 10*

10.1	$P(A\, or\, B) = P(A) + P(B) - P(A\, and\, B)$ $0{,}7 = 0{,}4 + k - P(A\, and\, B)$ $\therefore P(A\, and\, B) = k - 0{,}3$ For independent events: $P(A\, and\, B) = P(A) \times P(B)$ $k - 0{,}3 = 0{,}4 \times k$ $k = 0{,}5$	✓ substitution into addition rule ✓ $P(A\, and\, B) = k - 0{,}3$ ✓ substitution into $P(A\, and\, B) = P(A) \times P(B)$ ✓ answer (4)
10.2.1	$7! = 5040$	✓ 7! ✓answer (2)
10.2.2	$3! \times 5! = 720$	✓3! ✓5! ✓ 720 (3)
10.3.1	$\underline{\mathbf{3}} \times \mathbf{9} \times \mathbf{9} \times \underline{\mathbf{4}}$ =972	✓ <u>3</u> in first position ✓<u>4</u> in last position ✓ $\mathbf{9 \times 9}$ (3)
10.3.2	$9 \times \mathbf{9} \times \mathbf{9} \times \mathbf{9}$=6561 Total sample space) $9 \times \mathbf{9} \times \mathbf{9} \times 1$=729 (number of passwords divisible by 5) P(Multiple of 5) = $\frac{729}{6561} = 0.11$	✓ total sample space ✓ number of passwords divisible by 5 ✓✓answer (4)
		[16]

TOTAL / TOTAAL: 150