education

MPUMALANGA PROVINCE

REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE

GRADE 12



MATHEMATICS P1/WISKUNDE V1

SEPTEMBER 2024

MARKING GUIDELINES / NASIENRIGLYNE

Stanmorephysics.com

MARKS / PUNTE: 150

The marking guidelines consist of 12 pages.

Die nasienriglyne bestaan uit 12 bladsye.

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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 guiselines.
- 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

1.1.1	$x = 2$ or $x = -3$	✓ $x = 2$ ✓ $x = -3$ (2)
1.1.2	$3x^2 - 4x - 5 = 0$ $x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(3)(-5)}}{2(3)}$ $x = 2{,}12 \quad or \quad x = -0{,}79$	✓ standard form ✓ substitution ✓✓ $x-values$ (4)
1.1.3	$\sqrt{5-x} = 1 + x$ $5 - x = (1+x)^2$ $5 - x = 1 + 2x + x^2$ $x^2 + 3x - 4 = 0$ $(x+4)(x-1) = 0$ $x \neq -4 \quad or \quad x = 1$	✓ isolating surd ✓ squaring both sides ✓ standard form ✓ factoring ✓ $x \neq -4$ *or* $x = 1$ (5)
1.1.4	$0 < x < 5$	✓✓ answer (2)

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1.2	$x = -1 + 2y$ $(-1+2y)^2 - 7 - y^2 = -y$ $3y^2 - 3y - 6 = 0$ $y^2 - y - 2 = 0$ $(y-2)(y+1) = 0$ $y = 2 \quad or \quad y = -1$ $x = -1 + 2(2) \ or \ x = -1 + 2(-1)$ $= 3 \qquad\qquad = -3$	✓ $x = -1 + 2y$ ✓ substitution of x ✓ standard form ✓ factors ✓ both $y-values$ ✓ both x-values (6)
	OR $y = \frac{1+x}{2}$ $x^2 - 7 - \left(\frac{1+x}{2}\right)^2 = -\left(\frac{1+x}{2}\right)$ $x^2 - 7 - \frac{1+2x+x^2}{4} = -\left(\frac{1+x}{2}\right)$ $4x^2 - 28 - x^2 - 2x - 1 = -2 - 2x$ $x^2 - 9 = 0$ $(x-3)(x+3) = 0$ $x = 3 \quad or \quad x = -3$ $y = \frac{1+3}{2} \quad or \quad y = \frac{1-3}{2}$ $= 2 \qquad\qquad = -1$	✓ $y = \frac{1+x}{2}$ ✓ substitution ✓ standard form ✓ factors ✓ both x-values ✓ both $y-values$ (6)
1.3	$\Delta = (ab)^2 - 4(a^2)(b^2)$ $= -3a^2b^2$ $-3a^2b^2 < 0$ $\therefore$ roots are non-real for all real values of $a \ and \ b \neq 0$	✓ substitution ✓ $-3a^2b^2$ ✓ $-3a^2b^2 < 0$ +conclusion (3) **[22]**

QUESTION 2

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2.1	$6 \;;\; x \;;\; 26 \;;\; 45 \;;\; y$ $x-6 \quad 26-x \quad 19 \quad y-45$ $26-x-(x-6)=19-(26-x)=y-45-19$ $-2x+32=-7+x$ $-3x=-39$ $x=13$ $19-(26-x)=y-45-19$ $y=70$	✓1st differences ✓2nd differences ✓equate 2nd differences ✓value of x ✓substitute ✓value of y (6)
2.2.1	$220+213+206+\ldots-11$ $d=-7$ $T_n=220+(n-1)(-7)=-11$ $-7n+227=-11$ $-7n=-238$ $n=34$ $S_{34}=\frac{34}{2}[2(220)+(34-1)(-7)]$ OR $S_{34}=\frac{34}{2}[220+(-7)]$ $=3\,553$ $=3\,553$	✓ substitution in T_n ✓ equate to -11 ✓ value of n ✓ substitution in S_n ✓ answer (5)
2.2.2	$\sum_{n=1}^{34}(-7n+227)$	✓ $\sum_{n=1}^{34}$ ✓✓ $(-7n+227)$ (3)
2.3	$S_n=15+2\left(\frac{13,5}{1-0,9}\right)$ $=285$ <290 **OR** $S_n=\frac{15}{1-0,9}+\frac{13,5}{1-0,9}$ $=285$ <290	✓15 ✓2 ✓ $\frac{13,5}{1-0,9}$ ✓285 (4) **OR** ✓ $\frac{15}{1-0,9}$ ✓ $\frac{13,5}{1-0,9}$ ✓ sum ✓ 285 (4)
2.4.1	$r=\frac{1}{5}\left(\frac{1-t}{3}\right)$ and the series converges for $-1<r<1$	✓r

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	$-1 < \frac{1}{5}\left(\frac{1-t}{3}\right) < 1$ $-15 < 1-t < 15$ $-16 < -t < 14$ $-14 < t < 16$	✓ substitution ✓ answer (3)
2.4.2	$r = \frac{1}{5}\left(\frac{1-15}{3}\right) = \frac{-14}{15}$ $\therefore S_n$ exists $a = 25\left(\frac{1-15}{3}\right) = \frac{-350}{3}$ $S_\infty = \frac{\frac{-350}{3}}{1-\left(\frac{-14}{15}\right)}$ $= \frac{-1750}{29}$	✓ value of r ✓ value of a ✓ substitution into S_∞ ✓ answer (4)
2.5	$S_{70} = 2^{70-5} + 3 = 2^{65} + 3$ $S_{69} = 2^{69-5} + 3 = 2^{64} + 3$ $\therefore T_{70} = S_{70} - S_{69}$ $= 2.2^{64} - 2^{64}$ $= 1.2^{64}$	✓ S_{70} ✓ S_{69} ✓ substitution in T_{70} ✓ 1.2^{64} (4)
		[29]

QUESTION 3

3.1	$x = 0$	✓ answer (1)
3.2	$x = -2$ $y = -1$	✓✓equations (2)
3.3	$g(x) = b^x + c$ $y = b^x - 4$ $5 = b^2 - 4$ $9 = b^2$ $3^2 = b^2$ $b = 3$ $g(x) = 3^x - 4$	✓substitution of asymptote ✓substitution of (2 ; 5) ✓value of b ✓equation (4)

3.4	$y \in (-\infty;-1) \cup (-1;\infty)$ OR $y < -1 \quad or \quad y > -1$ OR $y \in R, y \neq -1$	✓critical points ✓notation (2)
3.5	$k(x) = -(3^x - 4) - 4$ $= -3^x + 4 - 4$ $= -3^x$	✓$-g(x) - 4$ ✓answer (2)
3.6	$y = -x + c$ $-1 = -(-2) + c$ $-3 = c$ $\therefore y = -x - 3$ OR $y = -(x+2) - 1$ $= -x - 3$	✓negative gradient ✓substitution ✓answer (3)
3.7	$x \in [0;\infty)$ OR $x \geq 0$	✓✓answer (2)
		[16]

QUESTION 4

4.1	$x = -\frac{1}{2(-1)}$ **OR** $f'(x) = -2x + 1 = 0$ $x = \frac{1}{2}$ $x = \frac{1}{2}$ $y = -\left(\frac{1}{2}\right)^2 + \frac{1}{2} + 6$ $= \frac{25}{4}$ $\therefore T.P\left(\frac{-1}{2};\frac{25}{4}\right)$	✓ $x = \frac{1}{2}$ ✓y-value ✓ answer (3)
4.2	$-x^2 + x + 6 = 0$ $x^2 - x - 6 = 0$ $(x-3)(x+2) = 0$ $x = 3$ or $x = -2$ $\therefore CD = 5$ units	✓ factors ✓answer (2)
4.3	$AB(x) = 3x + 10 - (-x^2 + x + 6)$ $= x^2 + 2x + 4$	✓ subtracting ✓ answer (2)
4.4	$AB'(x) = 2x + 2 = 0$ $x = -1$ Minimum of AB $= (-1)^2 + 2(-1) + 4$ $= 3$	✓ $AB' = 0$ ✓ $x - value$ ✓ substitution ✓answer (4)
4.5	$x < -\frac{10}{3}$ or $-2 < x < 3$	✓ $x < -\frac{10}{3}$ ✓✓ $-2 < x < 3$ (3)

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4.6	$k = f(x) + 2 = -x^2 + x + 8$ **TP:** $f(x) + 2 = -\left(\frac{1}{2}\right)^2 + \frac{1}{2} + 8$ $y = \frac{33}{4}$ $\therefore k < \frac{33}{4}$	✓ $-x^2 + x + 8$ ✓ $y = \frac{33}{4}$ ✓ $\therefore k < \frac{33}{4}$ (3)
		[17]

QUESTION 5

5.1	$A = P(1-i)^n$ $\frac{1}{4}P = P(1-0{,}1184)^n$ $\frac{1}{4} = (1-0{,}1184)^n$ $\log\frac{1}{4} = \log(1-0{,}1184)^n$ $\therefore n = \log_{(1-0{,}1184)}\frac{1}{4}$ $= 11$	✓ $A = \frac{1}{4}P$ ✓use of logarithms ✓answer (3)
5.2.1	$72\,000 = \frac{x\left[1-\left(1+\frac{0{,}098}{12}\right)^{-5\times12}\right]}{\frac{0{,}098}{12}}$ $x = \frac{72000\left(\frac{0{,}098}{12}\right)}{\left[1-\left(1+\frac{0{,}098}{12}\right)^{-60}\right]}$ $= R1\,522{,}71$	✓ $n = 60$ ✓ $i = \frac{0{,}098}{12}$ ✓substitution of P ✓answer (4)
5.2.2	$OB = \frac{1522{,}71\left[1-\left(1+\frac{0{,}098}{12}\right)^{-1{,}5\times12}\right]}{\frac{0{,}098}{12}}$ $= R25\,393{,}30$	✓substitution of x ✓ $n = 1{,}5\times12 = 18$ ✓answer (3)

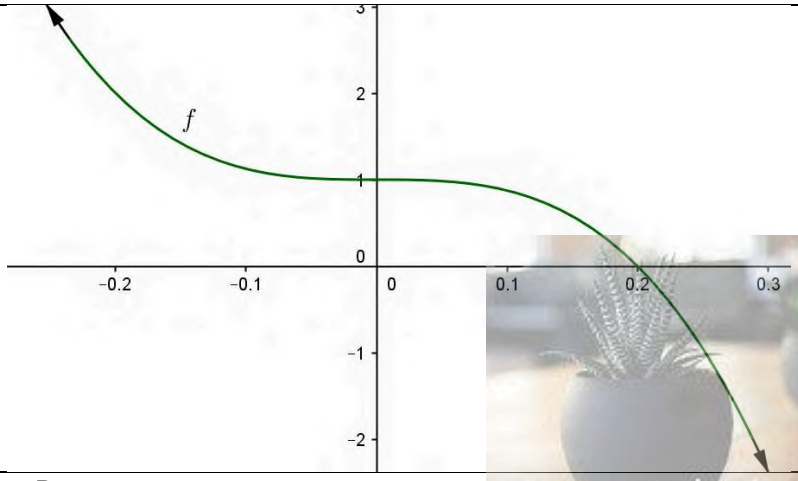
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5.2.3	$R1522,71\times(1,5\times12)$ $=R27\,408,78$ $\therefore R27\,408,78-R25\,393,30$ $=R2\,015,48$ Therefore by settling the amount he will save R2 015,48.	✓ $R27408,78$ ✓ $R27408,78-R25393,30$ ✓ answer (3)
5.3	$A=R793\,749,25\left[1+\frac{0,1025}{12}\right]^{3}$ $=R814\,263,3052$ New instalments will therefore be calculated as follows: $P=\frac{x\left[1-(1+i)^{-n}\right]}{i}$ $R814263,3052=\frac{x\left[1-\left(1+\frac{0,1025}{12}\right)^{-231}\right]}{\frac{0,1025}{12}}$ $x=R8089,20$	✓ $R814\,263,3052$ ✓substitution into P ✓ $n=231$ ✓ $\frac{0,1025}{12}$ ✓answer (5)
		[18]

QUESTION6

6.1	$f(x+h)=-\frac{2}{x+h}$ $f'(x)=\lim_{h\to 0}\frac{-\frac{2}{x+h}-\left[-\frac{2}{x}\right]}{h}$ $=\lim_{h\to 0}\frac{-\frac{2}{x+h}+\frac{2}{x}}{h}$ $=\lim_{h\to 0}\frac{\frac{-2x+2x+2h}{x(x+h)}}{h}$ $=\lim_{h\to 0}\frac{\frac{2h}{x^2+xh}}{h}$ $=\lim_{h\to 0}\frac{2}{x^2+xh}$ $=\frac{2}{x^2}$	✓ $f(x+h)$ ✓substitution of $f(x+h)$ ✓simplification ✓factoring h ✓answer (5)
6.2.1	$y(x-2)=x^2-4$ $y(x-2)=(x-2)(x+2)$ $y=x+2$ $\frac{dy}{dx}=1$	✓factors ✓ $y=x+2$ ✓answer (3)
6.2.2	$D_x\left[\frac{2}{x^{\frac{3}{5}}}\right]$ $D_x\left[2x^{-\frac{3}{5}}\right]$ $=-\frac{6}{5}x^{\frac{-8}{5}}$	✓ $\frac{2}{x^{\frac{3}{5}}}$ ✓ $2x^{-\frac{3}{5}}$ ✓ $\frac{6}{5}x^{\frac{-8}{5}}$ (3)
		[11]

QUESTION7

7.1	$f'(x)=0$ $-3x^2=0$ $x=0$ $\therefore y=1$	✓ $f'(x)=0$ ✓ $(0;1)$ (2)
7.2	$f''(x)=0$ $-750x=0$ $x=0$ $y=1$ Stationary point and point of inflection in this instance occur at same point.	✓ $f''(x)=0$ ✓ $(0;1)$ (2)
7.2		✓Shape ✓ y - intercept ✓ x-intercept (3)
7.3	$x<0, x\in R$	✓answer (1)
7.4	$f\left(\frac{1}{10}\right)=1-125\left(\frac{1}{10}\right)^3$ $=\frac{7}{8}$ $f'\left(\frac{1}{10}\right)=-375\left(\frac{1}{10}\right)^2$ $=-\frac{15}{4}$ $y-\frac{7}{8}=-\frac{15}{4}\left(x-\frac{1}{10}\right)$ $y=-\frac{15}{4}x+\frac{5}{4}$	✓$\frac{7}{8}$ ✓$-\frac{15}{4}$ ✓substitution ✓ equation (4)
		[12]

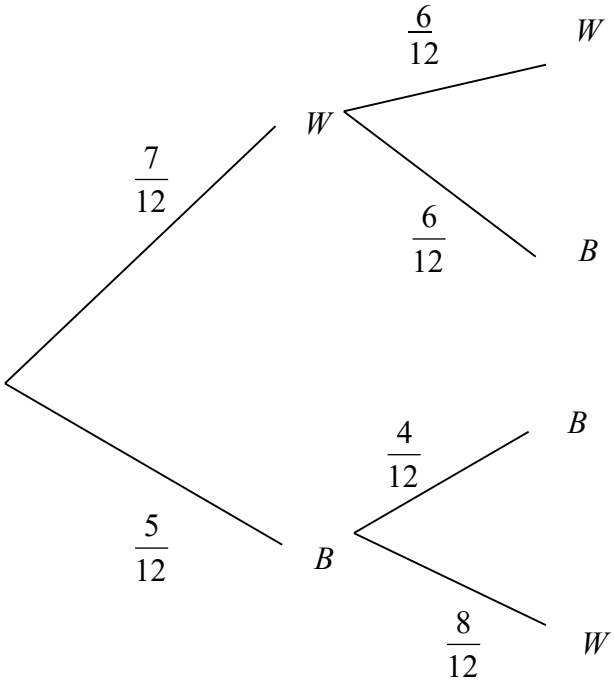
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QUESTION 8

8.1	$V = \pi x^2 h = 440$ $\therefore h = \frac{440}{\pi x^2}$	✓ equated to 440 ✓ $h = \frac{440}{\pi x^2}$ (2)
8.2	$SA = 2\pi x^2 + 2\pi x h$ $SA = 2\pi x^2 + 2\pi x\left(\frac{440}{\pi x^2}\right)$ $= 2\pi x^2 + \frac{880}{x}$	✓correct formula ✓substitution of h (2)
8.3	$SA'(x) = 0$ $4\pi x - 880x^{-2} = 0$ $4\pi x = \frac{880}{x^2}$ $4\pi x^3 = 880$ $\therefore x = 4{,}12$ cm	✓ $SA'(x) = 0$ ✓derivative ✓simplification ✓answer (4) **[8]**

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QUESTION9

9.1	$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ $0{,}57 = \frac{1}{2}P(B) + P(B) - 0$ $0{,}57 = \frac{3}{2}P(B)$ $P(B) = 0{,}38$	✓ $P(A \text{ and } B) = 0$ ✓ $P(A) = \frac{1}{2}P(B)$ ✓ substitute into addition rule ✓ answer (4)
9.2.1	P(First client takes a loaf of white bread) $= \frac{7}{12}$	✓answer (1)
9.2.2	$P(BB) = \frac{5}{12} \times \frac{4}{11}$ $= \frac{20}{132} = \frac{5}{33}$	✓ $\frac{4}{11}$ ✓ multiplication ✓ $\frac{20}{132}$ (3)
9.2.3	**Branch 1** **Branch 2**  $P(WB) \text{ or } P(BW) = \left(\frac{7}{12} \times \frac{6}{12}\right) + \left(\frac{5}{12} \times \frac{8}{12}\right) = \frac{41}{72}$	✓ branch 1 ✓ branch 2 ✓ $\frac{7}{12} \times \frac{6}{12}$ and $\frac{5}{12} \times \frac{8}{12}$ ✓answer (4)
9.3.1	$3 \times 5 = 15$	✓ answer (1)
9.3.2	$3 \times 5 \times 5 \times 3 = 225$	✓ $3 \times 5 \times 5 \times 3$ ✓ answer (2)
9.3.3	$3 \times 5 \times 4 \times 2 = 120$	✓✓ $3 \times 5 \times 4 \times 2$ (2)
		[17]

TOTAL MARKS: 150

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