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**MATHEMATICS P1 (*WISKUNDE V1*)
MEMORANDUM**

**MARKS/
PUNTE:** 150

This memorandum consists of 11 pages.
Hierdie memorandum bestaan uit 11 bladsye.

QUESTION/VRAAG 1			
1.1	1.1.1	$a + \frac{1}{a} = 2$ $a^2 + 1 = 2a$ $a^2 - 2a + 1 = 0$ $\therefore (a - 1)(a - 1) = 0$ $\therefore a = 1$	✓ simplification <i>vereenvoudiging</i> ✓ standard form <i>standaard vorm</i> ✓ factorisation <i>faktorisering</i> ✓ value of a <i>waarde van a</i> (4)
	1.1.2	$1 - 2x + \sqrt{5x - 1} = 0$ $\therefore \sqrt{5x - 1} = 2x - 1$ $\therefore 5x - 1 = 4x^2 - 4x + 1$ $\therefore 4x^2 - 9x + 2 = 0$ $\therefore (4x - 1)(x - 2) = 0$ $\therefore x = \frac{1}{4} \text{ or/of } x = 2$ Correct solution/Korrekte oplossing: $x = 2$	✓ transpose and square both sides <i>bring om en kwadreer beide kante</i> ✓ standard form <i>standaard vorm</i> ✓ factorise <i>faktoriseer</i> ✓ both values of x <i>beide waardes van x</i> ✓ correct value of x <i>korrekte waarde van x</i> (5)
	1.1.3	$\frac{x}{x-3} \leq 2$ $\therefore \frac{x}{x-3} - 2 \leq 0$ $\therefore \frac{x-2(x-3)}{x-3} \leq 0$ $\therefore \frac{x-2x+6}{x-3} \leq 0$ $\therefore \frac{-x+6}{x-3} \leq 0$ $\therefore x < 3 \text{ or/of } x \geq 6$	✓ simplification <i>vereenvoudiging</i> ✓ simplification <i>vereenvoudiging</i> ✓ one mark for each value of x <i>een punt vir elke waarde van x</i> (4)
1.2		$y - 2x + 1 = 0$ $\therefore y = 2x - 1 \quad (1)$ Substitute/Vervang (1) in $xy = 2y + x^2 + 3x - 10$ $\therefore x(2x - 1) = 2(2x - 1) + x^2 + 3x - 10$ $\therefore 2x^2 - x = 4x - 2 + x^2 + 3x - 10$ $\therefore x^2 - 8x + 12 = 0$ $\therefore (x - 6)(x - 2) = 0$ $\therefore x = 6 \text{ or/of } x = 2$ and/en $y = 2(6) - 1 \text{ or/of } y = 2(2) - 1$ $= 11 \qquad \qquad = 3$	✓ $y = 2x - 1$ ✓ substitution <i>vervanging</i> ✓ standard form <i>standaard vorm</i> ✓ both values of x <i>beide waardes van x</i> ✓ both values of y <i>beide waardes van y</i> (5)

1.3	$\frac{10^n + 4 \cdot 2^n}{5^{2n} + 4 \cdot 5^n} = \frac{(2 \cdot 5)^n + 4 \cdot 2^n}{5^n \cdot 5^n + 4 \cdot 5^n}$ $= \frac{2^n \cdot 5^n + 4 \cdot 2^n}{5^n \cdot 5^n + 4 \cdot 5^n}$ $= \frac{2^n(5^n + 4)}{5^n(5^n + 4)}$ $= \frac{2^n}{5^n}$	✓ write in factors <i>skryf in faktore</i> ✓ simplification <i>vereenvoudiging</i> ✓ factorise <i>faktorisering</i> ✓ simplification <i>vereenvoudiging</i> ✓ answer <i>antwoord</i> (5)
1.4	$n \frac{10^n + 4 \cdot 2^n}{5^{2n} + 4 \cdot 5^n} = n \frac{2^n}{5}$ $= \frac{2^n}{5}$	✓ equate values <i>vergelyk waardes</i> ✓ answer <i>antwoord</i> (2)
QUESTION/VRAAG 2		[25]
2.1	1 ; 4 ; 11 ; 22 ; 37 ; 56 ; 79	✓✓ 1 mark for each term <i>1 punt vir elk term</i> (2)
2.2	1 4 11 22 37 56 79 3 7 11 15 19 23 4 4 4 4 4 $\therefore T_n = an^2 + bn + c$ and/en $2a = 4$ $\therefore a = 2$ $\therefore T_n = 2n^2 + bn + c$ $n = 1 \quad T_1 = 2(1)^2 + b(1) + c$ $\therefore 1 = 2 + b + c$ (1) $\therefore -1 = b + c$ $n = 2 \quad T_2 = 2(2)^2 + b(2) + c$ $4 = 8 + 2b + c$ $-4 = 2b + c$ (2) $\therefore (2) - (1): -3 = b \therefore b = -3$ (1) $-1 = -3 + c$ $\therefore c = 2$ $\therefore T_n = 2n^2 - 3n + 2$	✓ Identification of 2 nd difference <i>Identifisering van 2^{de} verskil</i> ✓ value of a <i>waarde van a</i> ✓ 1 st equation <i>1^{ste} vergelyking</i> ✓ 2 nd equation <i>2^{de} vergelyking</i> ✓ value of c <i>waarde van c</i> ✓ formula <i>formule</i> (6)
		[8]

QUESTION/VRAAG 3			
3.1	3.1.1	$\sum_{k=1}^n 4 - 3k = -125$ $T_1 = 1$ $T_2 = -2$ $T_3 = -5$ $\therefore \text{sequence is arithmetic/ry is meetkundig}$	✓ 1 st 3 terms 1 ^{ste} 3 terme ✓ answer antwoord (2)
	3.1.2	$d = -3$	✓ value of d waarde van d (1)
	3.1.3	$S_n = \frac{n}{2} [2a + n - 1 d]$ $\therefore -125 = \frac{n}{2} [2 \cdot 1 + n - 1 \cdot -3]$ $-125 = \frac{n}{2} (2 - 3n + 3)$ $-250 = n(-3n + 5)$ $-250 = -3n^2 + 5n$ $\therefore 3n^2 - 5n - 250 = 0$ $\therefore (3n + 25)(n - 10) = 0$ $\therefore n = \frac{-25}{3} \text{ or/of } n = 10$ $\therefore n = 10 \quad n \in \mathbb{N}$	✓ substitution in correct formula vervanging in korrekte formule ✓ simplification vereenvoudiging ✓ standard form standaard vorm ✓ factorization faktorisering ✓ correct value of n korrekte waarde van n. (5)
3.2		$1 + (0,2) + (0,2)^2 + (0,2)^3$ $a = 1, r = \frac{0,2}{1}$ $= 0,2$ $S_n = \frac{a(1-r^n)}{1-r}$ $S_8 = \frac{1[1-(0,2)^8]}{1-0,2}$ $= \frac{1-(0,2)^8}{0,8}$ $= 1,25$	✓ expansion uitbreiding ✓ ratio verhouding ✓ substitution in correct formula vervanging in korrekte formule ✓ answer antwoord (4)
3.3	3.3.1	$r = \frac{(x-1)^2}{x-1}$ $= x - 1$ $-1 < r < 1$ $-1 < x - 1 < 1$ $0 < x < 2$	✓ ratio verhouding ✓ substitution vervanging ✓ answer antwoord (3)

	3.3.2	$\frac{1}{3} + \frac{1}{3}^2 + \frac{1}{3}^3$ $\therefore r = \frac{\frac{1}{3}^2}{\frac{1}{3}}$ $\therefore r = \frac{1}{3}$ $S_{\infty} = \frac{\frac{1}{3}}{1 - \frac{1}{3}}$ $= \frac{\frac{1}{3}}{\frac{2}{3}}$ $= \frac{1}{3} \times \frac{3}{2}$ $= \frac{1}{2}$	✓ ratio <i>verhouding</i> ✓ substitution in correct formula <i>vervangings in</i> <i>korrekte formule</i> ✓ answer <i>antwoord</i> (3)
			[18]
QUESTION/VRAAG 4			
4.1	4.1.1	$T_n = ar^{n-1}$ $T_n = 400 \cdot 1 + \frac{10}{100}^{n-1}$ $T_7 = 400(1,1)^{7-1}$ $= 400(1,1)^6$ $= 708,62$ $\therefore 7^{\text{th}} \text{ month/7}^{\text{de}} \text{ maand R708,62}$	✓ substitution in the correct formula <i>vervangings in</i> <i>korrekte formule</i> ✓ simplification <i>vereenvoudiging</i> ✓ answer <i>antwoord</i> (3)
	4.1.2	$S_n = \frac{a(r^n - 1)}{r - 1}$ $S_7 = \frac{a(r^7 - 1)}{r - 1}$ $\therefore S_7 = \frac{400[(1,1)^7 - 1]}{1,1 - 1}$ $= 3794,87$ Saves in 7 months/<i>Spaar in 7 maande</i> R3 794,87	✓ substitution into correct formula <i>vervangings in</i> <i>korrekte formule</i> ✓ simplification <i>vereenvoudiging</i> ✓ answer <i>antwoord</i> (3)
4.2	4.2.1	$a = 1900 \cdot 1 + \frac{0,075}{12}$ $r = \frac{T_2}{T_1} = \frac{1900 \cdot 1 + \frac{0,075}{12}}{1900 \cdot 1 + \frac{0,075}{12} \cdot 1}$ $\therefore r = 1 + \frac{0,075}{12}$ $S_n = \frac{a(r^n - 1)}{r - 1}$ $= \frac{1900 \cdot 1 + \frac{0,075}{12} \cdot 1 + \frac{0,075}{12} \cdot 240 - 1}{1 + \frac{0,075}{12} - 1}$ $= \text{R1 058 663,93}$ Alternative/Alternatief $a = 1911,875$ $r = 1,00525$ $= \frac{1911,875(1,00625^{240} - 1)}{-1,00625}$ $= \text{R1 058 663,93}$	✓ the value of a <i>die waarde van a</i> ✓ the value of r <i>die waarde van r</i> ✓ substitution in correct formula <i>vervangings in</i> <i>korrekte formule</i> ✓ answer <i>antwoord</i> (4)
	4.2.2	7,5%	✓ answer <i>antwoord</i> (1)
	4.2.3	$1 + i_e = \left(1 + \frac{7,5}{1200}\right)^{12}$ $i_e = 0,0776$ Effective annual interest rate = 7,76% <i>Effektiewe jaarlikse rentekoers = 7,76%</i>	✓ substitution <i>substitusie</i> ✓ Simplification <i>vereenvoudiging</i> ✓ Answer <i>antwoord</i> (3)
			[14]

QUESTION/VRAAG 5		
5.1	$y \in \mathbb{R} ; y \neq 5$	✓ answer <i>antwoord</i> (1)
5.2	$y = -3x + 2 \quad (1)$ $y = \frac{-3}{x+1} + 5 \quad (2)$ $\therefore (-3x + 2) = \frac{-3}{x+1} + 5$ $\therefore -3x^2 - x + 2 = -3 + 5(x + 1)$ $-3x^2 - 6x = 0$ $-3x(x + 2) = 0$ $\therefore x = 0 \text{ or/of } x = -2$ $\therefore y = -3(0) + 2 \text{ or/of } y = -3(-2) + 2$ $\quad \quad \quad = 2 \quad \quad \quad = 8$ $\quad \quad \quad (0 ; 2) \text{ and/en } (-2 ; 8)$	✓ equating f(x) and g(x) <i>vergelyk f(x) en g(x)</i> ✓ simplification <i>vereenvoudiging</i> ✓ standard form <i>Standaard vorm</i> ✓ for both x values <i>Vir beide x waardes</i> ✓ for both y values <i>vir beide y waardes</i> ✓✓ for each correct coordinates 1 mark <i>vir elke regte koördinaat 1 punt</i> (7)
5.3	$f(x) = \frac{-3}{x+1} + 5 \Rightarrow h \ x = \frac{3}{x+1} + 5$ reflection about asymptote: <i>refleksie in die asimptote:</i> $x = -1$ or/of reflection about asymptote: <i>refleksie in die asimptote:</i> $y = 5$	✓ for description <i>vir beskrywing</i> (1)
		[9]
QUESTION/VRAAG 6		
6.1	$y = a(x - p)^2 + q$ (3;-2): $y = a(x - 3)^2 - 2$ (0;0): $0 = a(0 - 3)^2 - 2$ $\quad \quad = 9a - 2$ $\therefore 9a = 2$ $\therefore a = \frac{2}{9}$ $g \ x = \frac{2}{9}(x - 3)^2 - 2$	✓ substituting (3;-2) ✓ substitusie (0;0) ✓ value of a <i>die waarde van a</i> (3)
6.2	B(6 ; 0)	✓ coordinate of B <i>koördinaat van B</i> (1)
6.3	g(x) is a one-too-many function; for every y-value there are two corresponding x-values. <i>g(x) is een-te-veel funksie; vir elke y-waarde is daar twee ooreenstemmende x-waardes</i>	✓ for answer/vir antw. ✓ substantiation/ <i>regverdiging</i> (2)

6.4		✓✓ both x intercepts <i>Beide x-afsnitte</i> ✓ turning point <i>draaipunt</i>	(3)
6.5	Range/Wydte : $y \leq 3$ or/of $y \geq 3$	✓ range/wydte	(1)
6.6	$g: y = \frac{2}{9}(x - 3 + 2)^2 - 2$ $= \frac{2}{9}(x - 1)^2 - 2$	✓✓ correct equation <i>korrekte vergelyking</i>	(2)
			[14]
QUESTION/VRAAG 7			
7.1	For inverse/ <i>Vir inverse</i> : $x = \frac{1}{2}^y$: $y = \log_{\frac{1}{2}}x$	✓ for base $\frac{1}{2}$ <i>vir basis $\frac{1}{2}$</i> ✓ answer <i>antwoord</i>	(2)
7.2		$g:$ ✓ for curve <i>vir kurwe</i> ✓ y-intercept <i>y-afsnit</i> $g^{-1}:$ ✓ for curve <i>vir kurwe</i> ✓ x-intercept <i>x-afsnit</i>	(4)
7.3	see graph/ <i>sien grafiek</i>	✓ dotted line <i>gebroke lyn</i>	(1)
7.4	$y = x$	✓ $y = x$	(1)
7.5	$\frac{1}{2}^x = \log_{\frac{1}{2}}x$ see graph/ <i>sien grafiek</i>		(1)
			[9]

QUESTION/VRAAG 8		
8.1	$P_v = 2\,000 ; i = \frac{i}{12} \quad n = 18 \quad F_v = 2860$ $P_v(1+i)^n = F_v \Rightarrow 2000 \left(1 + \frac{i}{1200}\right)^{18} = 2860$ $\therefore 1 + \frac{i}{12} = 1,43$ $\therefore 1 + \frac{i}{1200} = \sqrt[18]{1,43}$ $\therefore \frac{i}{1} = 0,020$ $\therefore i = 0,24083$ $\therefore i = 24,08\% \text{ or/of } 24\%$	✓ correct value of <i>i</i> korrekte waarde van <i>i</i> ✓ substitution into correct formula Vervanging in korrekte formule ✓ answer antwoord (3)
8.2	$F_v = \frac{x[(1+i)^n - 1]}{i}$ $= \frac{100[(1+0,006)^{12} - 1]}{0,006}$ $= R1\,244,99 (< R1\,300)$ No, he will be R55,01 short Nee, hy sal R55,01 kort	✓ value of <i>i</i> waarde van <i>i</i> ✓ substitution into correct formula vervanging in korrekte formule ✓ answer (correct conclusion) antwoord (korrekte afleiding) (3)
8.3	8.3.1 The deposit/Die deposito = 15% of R125 000,00 = R18 750 $\therefore$ The loan/Die lening = 125 000 – 18 750 = R106 250 or/of The loan/Die lening = 85% of R125 000 = R106 250	✓ value of loan waarde van (1)
	8.3.2 $P_v = \frac{x[1-(1+i)^{-n}]}{i}$ $106\,250 = \frac{x[1-(1+0,010\,416)^{-72}]}{0,010\,416}$ $\therefore 50,476x = 106\,250$ $\therefore x = \frac{106\,250}{50,476}$ $= R2\,104,96$	✓ value of <i>i</i> waarde van <i>i</i> ✓ substitution into correct formula Vervanging in korrekte formule ✓ answer antwoord (3)
[10]		

QUESTION/VRAAG 9		
9.1	$\lim_{h \rightarrow 0} \frac{2h}{h} = \lim_{h \rightarrow 0} 2$ $= 2$	✓ answer <i>antwoord</i> (1)
9.2	$V = \frac{1}{2}Ar - \pi r^3$ $\frac{dv}{dr} = \frac{1}{2}A - 3\pi r^2$	✓✓ one mark for each correct term <i>een punt vir elke korrekte term</i> (2)
9.3	$D_x a^2x^2 + x^{\frac{1}{2}} = 2a^2x + \frac{1}{2}x^{-\frac{1}{2}}$ $= 2a^2x + \frac{1}{2x}$	✓ 1 mark for each derivative <i>1 punt vir elke afgeleide</i> (2)
9.4	$f(x) = x^3$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{f(x+h)^3 - x^3}{h}$ $= \lim_{h \rightarrow 0} \frac{x^3 + 3x^2h + 3xh^2 + h^3 - x^3}{h}$ $= \lim_{h \rightarrow 0} (3x^2 + 3xh + h^2)$ $= 3x^2$	✓ substitution into correct formula <i>vervanging in korrekte formule</i> ✓ simplification <i>vereenvoudiging</i> ✓ simplification <i>vereenvoudiging</i> ✓ answer <i>antwoord</i> (4)
		[9]
QUESTION/VRAAG 10		
10.1	$y = x(x^2 - 27)$ $= x^3 - 27x$ At turning points/By draaipunt: $\frac{dy}{dx} = 0$ $3x^2 - 27 = 0$ $x^2 = 9$ $\therefore x = 3 \text{ or } -3$ $\therefore y = 3^3 - 27(3) \text{ or/of } y = (-3)^3 - 27(-3)$ $= -54 \quad \quad \quad = 54$ Turning points/Draaipunte (3 ; -54) or/of (-3 ; 54)	✓ $\frac{dy}{dx} = 0$ ✓ both values of x <i>Beide waardes van x</i> ✓ both values of y <i>Beide waardes van y</i> ✓ 1 mark for both coordinates 1 <i>punt vir koördinate vir beide draaipunte.</i> (4)

10.2	$f(x) = 4 + 12x - 3x^2 - 2x^3$ $\therefore f'(x) = 12 - 6x - 6x^2$ $\therefore f''(x) = -6 - 12x$ At point of inflection/By punt van infleksie: $\therefore f''(x) = 0$ $\therefore -6 - 12x = 0$ $-12x = 6$ $\therefore x = -\frac{1}{2}$ $\therefore y = 4 + 12\left(-\frac{1}{2}\right) - 3\left(-\frac{1}{2}\right)^2 - 2\left(-\frac{1}{2}\right)^3$ $= 4 - 6 - \frac{3}{4} + \frac{1}{4}$ $= -2\frac{1}{2}$ $\therefore$ coordinate are/koördinate is $-\frac{1}{2}; -2\frac{1}{2}$	✓ 1st derivative 1^{ste} afgeleide ✓ 2nd derivative 2^{de} afgeleide ✓ value for x waarde van x ✓ value for y waarde van y ✓ coordinate koördinate (5)
10.3	$\frac{dy}{dx} = 3mx^2 - 6x - 12$ $3mx^2 - 6x - 12 = 0$ $x = 2 \Rightarrow \therefore 3m(2)^2 - 6(2) - 12 = 0$ $\therefore 12m - 12 - 12 = 0$ $\therefore 12m = 24$ $\therefore m = 2$ $\therefore y = 2x^3 - 3x^2 - 12x + n$ At $x = 2$ is $y = -3$ $\therefore -3 = 2(2)^3 - 3(2)^2 - 12(2) + n$ $\therefore -3 = 16 - 12 - 24 + n$ $\therefore -3 = -20 + n$ $\therefore n = 17$	✓ differentiation differensiasie ✓ substitution vervanging ✓ value of m waarde van m ✓ substitution of x and y vervanging van x en y ✓ value of n waarde van n (5)
		[14]
QUESTION/VRAAG 11		
11.1	Volume = $\pi r^2 h$ $10\,000 = \pi r^2 h$ $\therefore h = \frac{10\,000}{\pi r^2}$	✓ formula formule ✓ substitution vervanging ✓ h (3)
11.2	Exterior area/Buite oppervlakte $A = 2(\pi r^2) + 2\pi r h$ $= 2\pi r^2 + \frac{2\pi r \cdot 10\,000}{\pi r^2}$ $= 2\pi r^2 + \frac{20\,000}{r}$	✓ formula formule ✓ substitution of h vervanging van h (2)

11.3	For minimum/Vir minimum: $\frac{dA}{dr} = 0$ $\therefore 4\pi r - \frac{20\,000}{r^2} = 0$ $\therefore 4\pi r^3 - 20\,000 = 0$ $\therefore 4\pi r^3 = 20\,000$ $\therefore r = 11,68$ and/en $h = \frac{10\,000}{\pi r^2}$ $= 23,35$ Allow/Laat toe: 23,33 or/of 23,34	✓ differentiation of A <i>differensiasie van A</i> ✓ simplification <i>vereenvoudiging</i> ✓ value of r <i>waarde van r</i> ✓ value of h. <i>waarde van h</i> (4)
QUESTION/VRAAG 12		
12.1	$2x + y \geq 10$ ✓✓ $x + 3y \geq 15$ ✓✓ $x > 0$ ✓ $y > 0$ ✓	✓✓ for 1st inequality <i>vir 1^{ste} ongelykheid</i> ✓✓ 2nd inequality <i>2^{de} ongelykheid</i> ✓ $x > 0$ ✓ $y > 0$ (4)
		✓✓ feasible region <i>gangbare gebied</i> ✓ line/lyn $2x + y = 10$ ✓ line/lyn $x + 3y = 15$ (6)
12.3	Minimum number of capsules and tablets: <i>Minimum aantal kapsule en tablette</i> 3 tablets/tablette Read at A./Gelees by A. 4 capsules/kapsules	✓✓ tablets <i>tablette</i> ✓✓ capsules <i>kapsules</i> (3)
TOTAL/TOTAAL:		
150		