

**NATIONAL
SENIOR CERTIFICATE/
NASIONALE
SENIOR SERTIFIKAAT**

GRADE/GRAAD 11

NOVEMBER 2019

**MATHEMATICS P1/WISKUNDE V1
MARKING GUIDELINE/NASIENRIGLYN
EXEMPLAR/EKSEMPLAAR**

MARKS/PUNTE: 150

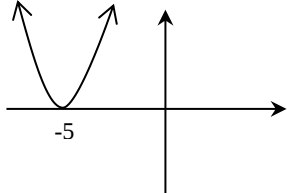
This marking guideline consists of 13 pages./
Hierdie nasienriglyn bestaan uit 13 bladsye.

NOTE/LET WEL:

- If a candidate answers a question TWICE, mark the FIRST attempt ONLY.
Indien 'n kandidaat 'n vraag TWEE keer beantwoord, merk SLEGS die EERSTE poging.
- Consistent accuracy applies in ALL aspects of the marking guideline.
Volgehoue akkuraatheid is in ALLE aspekte van die nasienriglyn van toepassing.
- If a candidate crossed out an attempt of a question and did not redo the question, mark the crossed-out attempt.
Indien 'n kandidaat 'n poging vir 'n vraag deurgetrek het en nie die vraag weer beantwoord het nie, merk die poging wat deurgetrek is.
- The mark for substitution is awarded for substitution into the correct formula.
Die punt vir substitusie word toegeken vir substitusie in die korrekte formule.

QUESTION 1/VRAAG 1

1.1.1	$x^2 - 5x - 6 = 0$ $(x - 6)(x + 1) = 0$ $\therefore x = 6 \text{ or / of } x = -1$	✓ method / metode ✓ ✓ answers / antwoorde (3)
1.1.2	$(2x - 3)(x + 1) = 9$ $2x^2 + 2x - 3x - 3 - 9 = 0$ $2x^2 - x - 12 = 0$ $\therefore x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-1) \pm \sqrt{(-1)^2 - 4(2)(-12)}}{2(2)}$ $= \frac{1 \pm \sqrt{97}}{4}$ $= 2,71 \text{ or / of } -2,21$	✓ standard form / standaardvorm ✓ substitution / vervanging ✓ ✓ answers / antwoorde (4)
1.1.3	$x - \sqrt{x - 1} = 3$ $x - 3 = \sqrt{x - 1}$ $(x - 3)^2 = x - 1$ $x^2 - 6x + 9 = x - 1$ $x^2 - 7x + 10 = 0$ $(x - 2)(x - 5) = 0$ $\therefore x \neq 2 \text{ or / of } x = 5$	✓ squaring both sides kwadreer beide kante ✓ standard form / standaardvorm ✓ factors / faktore ✓ both x values / beide x-waardes ✓ selection / keuse (5)

1.1.4	$x(x+10) > -25$ $x^2 + 10x + 25 > 0$ $(x+5)^2 > 0$ $\therefore x \in \mathbb{R}$ but/maar $x \neq -5$		✓ standard form / <i>standaardvorm</i> ✓ factors / <i>faktore</i> ✓ $x \in \mathbb{R}$ ✓ $x \neq -5$
(4)			
1.2	$2x - y = 1$ (1) $3x^2 - 4xy + y^2 = 0$ (2) $y = 2x - 1$ (3) Substitute (3) into (2) : <i>Vervang (3) in (2)</i> $3x^2 - 4x(2x - 1) + (2x - 1)^2 = 0$ $3x^2 - 8x^2 + 4x + 4x^2 - 4x + 1 = 0$ $-x^2 + 1 = 0$ $1 = x^2$ or / of $x^2 - 1 = 0$ $\pm\sqrt{1} = \sqrt{x^2}$ or / of $(x-1)(x+1) = 0$ $\therefore x = 1$ or / of $x = -1$ $y = 2(1) - 1$ or / of $y = 2(-1) - 1$ $= 1$ or / of $y = -3$ OR / OF $2x - y = 1$ (1) $3x^2 - 4xy + y^2 = 0$ (2) $x = \frac{1}{2}(y+1)$ (3) $3[\frac{1}{2}(y+1)]^2 - 4y[\frac{1}{2}(y+1)] + y^2 = 0$ $3(\frac{y^2}{4} + \frac{y}{2} + \frac{1}{4}) - 2y^2 - 4y + y^2 = 0$ $3y^2 + 6y + 3 - 4y^2 - 8y = 0$ $-y^2 - 2y + 3 = 0$ $y^2 + 2y - 3 = 0$ $(y-1)(y+3) = 0$ $\therefore y = 1$ or / of $y = -3$ $x = \frac{1}{2}(1+1)$ or / of $x = \frac{1}{2}(-3+1)$ $x = 1$ or / of $x = -1$	✓ $y = 2x - 1$ ✓ substitution / <i>vervanging</i> ✓ standard form / <i>standaardvorm</i> ✓ method/factors : <i>metode/faktore</i> ✓ both x-values / <i>beide x-waardes</i> ✓ both y-values / <i>beide y-waardes</i>	
(6)			

1.3	$[x - (-3 + 2\sqrt{2})][x - (-3 - 2\sqrt{2})] = 0$ $[(x + 3) + 2\sqrt{2}][(x + 3) - 2\sqrt{2}]$ $(x + 3)^2 - (2\sqrt{2})^2 = 0$ $x^2 + 6x + 9 - 8 = 0$ $x^2 + 6x + 1 = 0$ but y intercept is 4 / (maar y - afsnit is 4) $\therefore f(x) = 4x^2 + 24x + 4$	✓ equation / vergelyking ✓ difference of 2 squares <i>verskil tussen 2 kwadrate</i> ✓ expanding / uitbreiding ✓ $x^2 + 6x + 1$ ✓ $4x^2 + 24x + 4$ (5)
		[27]

QUESTION 2/VRAAG 2

2.1	$\frac{8^{n-3}.32^{-n+1}.6^{2n}}{9^n} = \frac{(2^3)^{n-3}.(2^5)^{-n+1}.(2.3)^{2n}}{(3^2)^n}$ $= \frac{2^{3n-9}.2^{-5n+5}.2^{2n}.3^{2n}}{3^{2n}}$ $= 2^{3n-9-5n+5+2n}$ $= 2^{-4}$ $= \frac{1}{16}$	$\checkmark (2^3)^{n-3}.(2^5)^{-n+1}.(2.3)^{2n}$ $\checkmark (3^2)^n$ $\checkmark \frac{2^{3n-9}.2^{-5n+5}.2^{2n}.3^{2n}}{3^{2n}}$ $\checkmark \text{ simplification / vereenvoudiging}$ $\checkmark \text{ answer / antwoord}$	(5)	
2.2.1	$x^{\frac{2}{3}}=4$ $\left(x^{\frac{2}{3}}\right)^3=4^3$ $x^2=4^3$ $x^2=64$ $x=8$	OR / OF $x^{\frac{2}{3}}=4$ $x^{\frac{2}{3} \times \frac{3}{2}}=\left(2^2\right)^{\frac{3}{2}}$ $\therefore x=2^3$ $x=8$	$\checkmark \text{ method / metode}$ $\checkmark x^2=64 \text{ or/of } x=2^3$ $\checkmark \text{ answer / antwoord}$	(3)
2.2.2	$2^{2x}-4^{x-1}=12$ $2^{2x}-2^{2x-2}=12$ $2^{2x}-2^{2x}.2^{-2}=12$ $2^{2x}\left(1-\frac{1}{4}\right)=12$ $2^{2x}.\frac{3}{4}=12$ $2^{2x}=16 \text{ or/of } 4^x=16$ $2^{2x}=2^4 \text{ or/of } 4^x=4^2$ $2x=4$ $\therefore x=2$	$\checkmark 2^{2x}-2^{2x-2}=12$ $\checkmark 2^{2x}\left(1-\frac{1}{4}\right)=12$ $\checkmark 2^{2x}=2^4 \text{ or/of } 4^x=4^2$ $\checkmark x=2$	(4)	

2.3.1	g is undefined when: g is ongedefinieerd wanneer $3 - x = 0$ $\therefore x = 3$	✓✓ answer / antwoord (2)
2.3.2	$g(x) = \frac{x^2 - 2x + 2}{3 - x}$ $= \frac{((x - 2x + 1) - 1 + 2)}{3 - x}$ $= \frac{(x - 1)^2 + 1}{3 - x}$ For g to be equal to 0, the numerator must be equal to 0, but the minimum value for the numerator is 1 $\therefore g$ will never be equal to zero. Vir g om gelyk aan 0 te wees moet die teller gelyk aan 0 wees, maar die minimumwaarde vir die teller is 1. $\therefore g$ sal nooit gelyk aan nul wees nie. OR/OF For $g(x)$ to be = 0, the numerator must be = 0 Vir $g(x)$ om = 0, moet die teller = 0 $x^2 - 2x + 2 = 0$ but / maar : $\Delta = b^2 - 4ac$ $= (-2)^2 - 4(1)(2)$ $= -8$ $\therefore$ No solution / Geen oplossing Numerator will never be equal to 0. Teller sal nooit gelyk aan 0 wees nie.	✓ completing the square voltooïing van kwadraat ✓ For g to be equal to 0, the numerator must be equal to 0 Vir g om gelyk aan 0 te wees moet die teller gelyk aan 0 wees ✓ minimum value of numerator = 1 minimumwaarde van teller = 1 (3) ✓ For $g(x)$ to be = 0, the numerator must be = 0 Vir $g(x)$ om = 0, moet die teller = 0 ✓ -8 ✓ no solution / geen oplossing (3)
		[17]

QUESTION 3/VRAAG 3

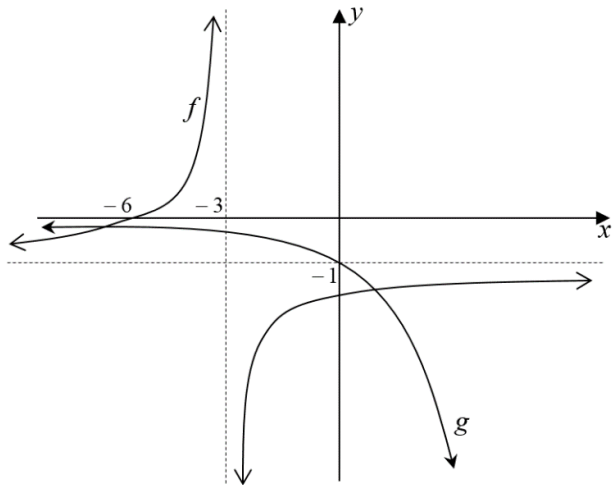
3.1.1	10 ; 7 ; 4 ; 1 ; -2 ; -5	✓ -2 ✓ -5 (2)
3.1.2	$T_n = 13 - 3n$	✓ 13 ✓ -3n (2)
3.1.3	$-179 = 13 - 3n$ $3n = 192$ $\therefore n = 64$	✓ equating -179 to $13 - 3n$ <i>stel -179 gelyk aan $13 - 3n$</i> ✓ simplifying / vereenvoudiging ✓ answer / antwoord (3)
3.2	$T_2 - T_1 = T_3 - T_2$ $x + 9 - (3x - 2) = 2x + 5 - (x + 9)$ $x + 9 - 3x + 2 = 2x + 5 - x - 9$ $-2x + 11 = x - 4$ $-3x = -15$ $\therefore x = 5$	✓ substitution / vervanging ✓ simplifying / vereenvoudiging ✓ $x = 5$ (3)
		[10]

QUESTION 4/VRAAG 4

4.1	0 ; 12	✓ 0 ✓ 12 (2)
4.2	$2a = -8$ $3a + b = 44$ $a + b + c = -128$ $\therefore a = -4$ $3(-4) + b = 44$ $-4 + 56 + c = -128$ $b = 56$ $c = -180$ $\therefore T_n = -4n^2 + 56n - 180$	✓ $a = -4$ ✓ $b = 56$ ✓ $c = -180$ ✓ $T_n = -4n^2 + 56n - 180$ (4)

4.3	$T_n = -4n^2 + 56n - 180$ $= -4(n^2 - 14n + 45)$ $= -4(n^2 - 14n + 49 - 49 + 45)$ $= -4[(n-7)^2 - 4]$ $= -4(n-7)^2 + 16$ $\therefore$ biggest value for T_n is 16 grootste waarde vir T_n is 16 OR / OF $T_n = -4n^2 + 56n - 180$ $\text{max at/maks by : } n = -\frac{b}{2a}$ $= \frac{-56}{2 \cdot (-4)}$ $= 7$ $\therefore T_7 = -4(7)^2 + 56(7) - 180$ $= 16$	✓ common factor / <i>gemene faktor</i> ✓ completing the square <i>voltooiing van vierkant</i> ✓ $(n-7)^2 - 4$ ✓ $+16$ ✓ identifying the biggest T_n value <i>identifiseer die grootste T_n waarde</i> (5) ✓ $-\frac{b}{2a}$ ✓ substitution / <i>vervanging</i> ✓ $n = 7$ ✓ substituting $n = 7$ into T_n <i>vervang $n = 7$ in T_n</i> ✓ answer / <i>antwoord</i> (5)
4.4	$k \leq -16$	✓ ✓ answer / <i>antwoord</i> (1 mark if/punt as $k < -16$) (2)
		[13]

QUESTION 5/VRAAG 5

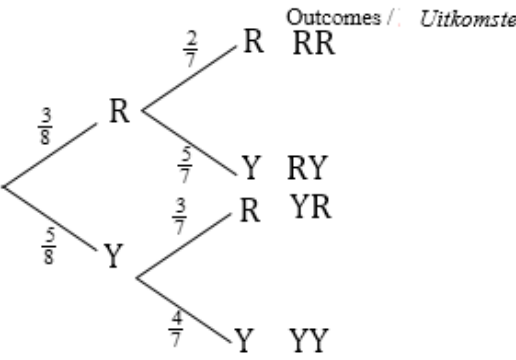
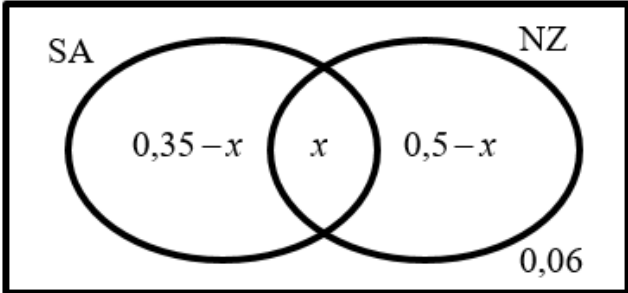
5.1	$g(x) = -a^x$ $-3 = -a^1$ $a = 3$	✓ substituting -3 and 1 <i>vervang -3 en 1</i> ✓ answer / <i>antwoord</i> (2)
5.2	$x = -3$ and / <i>en</i> $y = -1$	✓ $x = -3$ ✓ $y = -1$ (2)
5.3	$y < 0 ; y \in \mathbf{R}$	✓ answer / <i>antwoord</i> (1)
5.4	$\frac{-3}{x+3} - 1 = 0$ $\frac{-3}{x+3} = 1$ $-3 = x + 3$ $\therefore x = -6$ $\frac{-3}{0+3} - 1 = y$ $\therefore y = -2$	✓ substituting $y = 0$ <i>vervang $y = 0$</i> ✓ $x = -6$ ✓ $y = -2$ (3)
5.5		<i>f:</i> ✓ x and y -intercepts <i>x- en y-afsnitte</i> ✓ asymptotes / <i>asimptote</i> ✓ shape / <i>vorm</i> <i>g:</i> ✓ y -intercept / <i>y-afsnit</i> ✓ asymptote / <i>asimptoot</i> ✓ shape / <i>vorm</i> (6)
5.6	$y = x + k$ $-1 = -3 + k$ $\therefore k = 2$ $\therefore y = x + 2$ OR / OF $y = (x - (-3)) - 1$ $= (x + 3) - 1$ $\therefore y = x + 2$	✓ substituting $(-3; -1)$ <i>vervang $(-3 ; -1)$</i> ✓ $y = x + 2$ (2) ✓ substituting $(-3; -1)$ <i>vervang $(-3 ; -1)$</i> ✓ $y = x + 2$ (2)
5.7	$b = 1$	✓✓ answer / <i>antwoord</i> (2)
		[18]

6.5	$x + 4 = -x^2 - 2x + 8$ $x^2 + 3x - 4 = 0$ $(x + 4)(x - 1) = 0$ $\therefore x = -4 \text{ or / of } x = 1$ $\Rightarrow y = 1 + 4$ $= 5$ $\therefore S(1; 5)$	$\checkmark g(x) = f(x)$ $\checkmark$ standard form / <i>standaardvorm</i> $\checkmark$ factors / <i>faktore</i> $\checkmark$ choosing / <i>kies</i> $x = 1$ $\checkmark y = 5$
6.6	Length of TV at max / <i>Lengte van TV by maks:</i> $= y_T - y_V$ $= -x^2 - 2x + 8 - (x + 4)$ $= -x^2 - 3x + 4$ $= -(x^2 + 3x - 4)$ $= -(x^2 + 3x + \frac{9}{4} - \frac{9}{4} - 4)$ $= -\left[(x + \frac{3}{2})^2 - \frac{25}{4}\right]$ $= -(x + \frac{3}{2})^2 + \frac{25}{4}$ $\therefore$ Length TV at max / <i>Lengte TV by maks:</i> $= 6,25 \text{ units / eenhede}$ OR / OF Length of TV at max / <i>Lengte van TV by maks:</i> $= y_T - y_V$ $= -x^2 - 2x + 8 - (x + 4)$ $= -x^2 - 3x + 4$ $x = -\frac{b}{2a}$ $= -\frac{(-3)}{2(-1)} = -\frac{3}{2}$ Length of TV at max / <i>Lengte van TV by maks:</i> $y = -(\frac{3}{2})^2 - 3(-\frac{3}{2}) + 4$ $= 6,25 \text{ units / eenhede}$	$\checkmark -x^2 - 2x + 8 - (x + 4)$ $\checkmark$ factoring out -1 / <i>gemene faktor -1</i> $\checkmark$ completing the square / <i>voltooing van vierkant</i> $\checkmark -(x + \frac{3}{2})^2 + \frac{25}{4}$ $\checkmark$ answer / <i>antwoord</i>
6.7	$-4 < x < 0 \text{ or / of } x > 2$ OR / OF $x \in [(-4; 0) \cup (2; \infty)]$	$\checkmark \checkmark -4 < x < 0 \checkmark x > 2$ $\checkmark x \in \checkmark \checkmark [(-4; 0) \cup (2; \infty)]$ (Accuracy / <i>Akkuraatheid</i>)
		(5)
		(3)
		[25]

QUESTION 7/VRAAG 7

7.1	$A = P(1-i)^n$ $7\,210 = P(1-0,134)^5$ $7\,210 = 0,4870678P$ $\therefore P = R14802,87$	✓ formula / formule ✓ $n = 5$ ✓ substitution into correct formula <i>vervang in korrekte formule</i> ✓ answer / antwoord (4)
7.2	$i_{eff} = \left(1 + \frac{i_{nom}}{n}\right)^n - 1$ $= \left(1 + \frac{0,082}{4}\right)^4 - 1$ $\approx 0,0846$ $\therefore r_{eff} \approx 8,46\%$	✓ $n = 4$ ✓ substitution/ <i>vervang</i> ✓ answer / antwoord (3)
7.3.1	$A = P(1+i)^n$ $= R20\,000 \left(1 + \frac{0,103}{12}\right)^{12}$ $\approx R22\,160,09$	✓ $i = \frac{0,103}{12}$ and/en ✓ $n = 12$ ✓ substitution into correct formula <i>vervang in korrekte formule</i> ✓ answer / antwoord (4)
7.3.2	Let the money that he withdrew be x / <i>Laat die geld wat hy onttrek het x wees</i> Balance at start of 2nd year / <i>Balans aan die begin van 2de jaar</i> $R22\,160,09 + R15\,000 = R37\,160,09$ $\left[\left(R37\,160,09 \left(1 + \frac{0,115}{12} \right)^{24} \right) - x \right] \left[\left(1 + \frac{0,168}{4} \right)^8 \right] = R30\,183,64$ $(46\,718,49558 - x) = \frac{30\,183,64}{\left(1 + \frac{0,168}{4} \right)^8}$ $-x = \frac{30\,183,64}{\left(1 + \frac{0,168}{4} \right)^8} - 46\,718,49558$ $-x = -24\,999,9939$ $\therefore x = R25\,000,00$	✓ $R22\,160,09 + R15\,000$ ✓ $\left(R37\,160,09 \left(1 + \frac{0,115}{12} \right)^{24} \right)$ ✓ subtracting x / <i>trek x af</i> ✓ $\left[\left(R37\,160,09 \left(1 + \frac{0,115}{12} \right)^{24} \right) - x \right] \left[\left(1 + \frac{0,168}{4} \right)^8 \right]$ ✓ equating to / <i>stel gelyk aan</i> $R\,30\,183,64$ ✓ answer / antwoord (6)
		[17]

QUESTION 8/VRAAG 8

8.1.1	Let Red balls be R and Yellow be Y Laat Rooi balle R en Geel balle Y wees  Outcomes / Uitkomst RR RY YR YY	✓ first branch / eerste tak ✓ probabilities of first branch waarskynlikhede van eerste tak ✓ second branches / tweede takke ✓ probabilities of second branches waarskynlikhede van tweede takke ✓ outcomes / uitkomst (5)
8.1.2	P(different colours/ verskillende kleure) = P(RY) or / of P(YR) = P(RY) + P(YR) = $\left(\frac{3}{8} \times \frac{5}{7}\right) + \left(\frac{5}{8} \times \frac{3}{7}\right)$ = $\frac{15}{28}$ or / of 0,54 OR / OF P(different colors) = 1 – P(same colour) P(verskillende kleure) = 1 – P(dieselfde kleur) = 1 – (P(RR) + P(YY)) = 1 – $\left(\left(\frac{3}{8} \times \frac{2}{7}\right) + \left(\frac{5}{8} \times \frac{4}{7}\right)\right)$ = 1 – $\frac{13}{28}$ = $\frac{15}{28}$ or / of 0,54	✓ P(RY) + P(YR) ✓ $\frac{3}{8} \times \frac{5}{7}$ ✓ $\frac{5}{8} \times \frac{3}{7}$ ✓ answer / antwoord (4) ✓ 1 – (P(RR) + P(YY)) ✓ $\frac{3}{8} \times \frac{2}{7}$ ✓ $\frac{5}{8} \times \frac{4}{7}$ ✓ answer / antwoord (4)
8.2.1	Let x be the probability that both SA & NZ reach finals Laat x die waarskynlikheid wees dat beide SA & NZ die finaal haal 	✓ 0,06 ✓ 0,35 – x & 0,5 – x ✓ x (3)
8.2.2	$0,35 - x + x + 0,5 - x + 0,06 = 1$ $\therefore x = 0,09$	✓ equation/vergeliking ✓ answer/antwoord (2)
[14]		

QUESTION 9/VRAAG 9

9.1	$a = 83$ $b = 240$	✓ $a = 83$ ✓ $b = 240$ (2)
9.2	If M and F are independent, then <i>As M en F onafhanklik is, dan is:</i> $P(M) \times P(F) = P(M \text{ and/en } F)$ $P(M) \times P(F) = \frac{125}{500} \times \frac{260}{500}$ $= \frac{13}{100}$ or 0,13 $P(M \text{ and/en } F) = \frac{65}{500} = \frac{13}{100}$ or / of 0,13 $\therefore P(M) \times P(F) = P(M \text{ and/en } F)$ $\therefore$ M and F are independent events. <i>M en F is onafhanklike gebeurtenisse.</i>	✓ correct rule / korrekte reël ✓ $P(M) = \frac{125}{500} \times P(F) = \frac{260}{500}$ ✓ $\frac{13}{100}$ or / of 0,13 ✓ $P(M \text{ and/en } F)$ $= \frac{65}{500}$ or / of 0,13 and conclusion / en gevolgtrekking (4)
9.3	$P(M/F \text{ or/of } PS/F) = P(M/F) + P(PS/F) - P(M/F \text{ and/en } PS/F)$ $= \frac{65}{500} + \frac{114}{500} - 0$ $= \frac{179}{500}$ or/of 0,36	✓ correct rule / korrekte reël ✓ $\frac{65}{500} + \frac{114}{500}$ ✓ answer / antwoord (3)
		[9]

TOTAL/TOTAAL: 150