



**NATIONAL
SENIOR CERTIFICATE
NASIONALE
SENIORSERTIFIKAAT**

GRADE/GRAAD 11

NOVEMBER 2024

**TECHNICAL MATHEMATICS P1/
TEGNIESE WISKUNDE V1
MARKING GUIDELINE/NASIENRIGLYN**

MARKS/PUNTE: 150

MARKING CODES/NASIENKODES	
A	Accuracy/Akkuraatheid
CA	Consistent accuracy/Volgehoue akkuraatheid
M	Method/Metode
R	Rounding/Afronding
NPR	No penalty for rounding/Geen penalisering vir afronding nie
NPU	No penalty for units omitted/Geen penalisering vir eenhede weggelaat nie
S	Simplification/Vereenvoudiging
SF	Substitution in correct formula/Vervanging in korrekte formule
AO	Answer Only / Slegs antwoord

This marking guideline consists of 15 pages./
Hierdie nasienriglyn bestaan uit 15 bladsye.

NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed-out version.
- Consistent accuracy (CA) applies to ALL aspects of the marking guideline.
- Assuming answers/values to solve a problem is NOT acceptable.

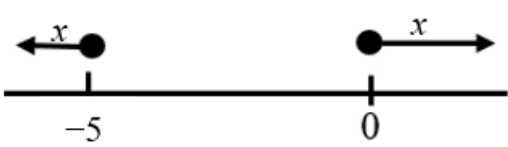
LET WEL:

- *As 'n kandidaat TWEE KEER 'n vraag beantwoord, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n poging tot 'n vraag deurgehaal het en nie die vraag oorgedoen het nie, sien die gekruiste weergawe na.*
- *Volgehoue akkuraatheid (CA) is van toepassing op ALLE aspekte van die nasienriglyn.*
- *Aanvaarding van antwoorde/waardes om 'n probleem op te los, is NIE aanvaarbaar NIE.*

QUESTION / <i>VRAAG 1</i>			
1.1.1	$x^2(2x - x^{-2})$ $= 2x^3 - x^0$ $= 2x^3 - 1$	$\checkmark 2x^3$ $\checkmark -x^0$ $\checkmark -1$	<p>A</p> <p>A</p> <p>CA (3)</p>
1.1.2	$\sqrt[4]{2^{12} \left(p^2 + \frac{1}{4}\right)^4}$ $= \left(2^{12 \times \frac{1}{4}} \cdot \left(p^2 + \frac{1}{4}\right)^{4 \times \frac{1}{4}}\right) \text{ OR/OF } 2^{12 \times \frac{1}{4}} (p^2 + 2^{-2})^{4 \times \frac{1}{4}}$ $= 2^3 \left(p^2 + \frac{1}{4}\right) \quad \text{OR/OF } 2^3 (p^2 + 2^{-2})$ $= 8 \left(p^2 + \frac{1}{4}\right) \quad \quad \quad 8p^2 + 2^{3-2}$ $= 8p^2 + 2 \quad \quad \quad 8p^2 + 2$	$\checkmark \left(2^{12 \times \frac{1}{4}} \cdot \left(p^2 + \frac{1}{4}\right)^{4 \times \frac{1}{4}}\right)$ $\checkmark 2^3 \left(p^2 + \frac{1}{4}\right)$ $\checkmark 8p^2 + 2$	<p>A</p> <p>CA</p> <p>CA (3)</p>
1.1.3	$= \frac{\sqrt{3 \times 5} + \sqrt{3}}{\sqrt{3}}$ $= \frac{\sqrt{3}(\sqrt{5} + 1)}{\sqrt{3}}$ $= \sqrt{5} + 1$	$\checkmark \sqrt{3 \times 5}$ \checkmark Factorisation / <i>faktoriiseer</i> $\checkmark \sqrt{5} + 1$	<p>A</p> <p>CA</p> <p>CA (3)</p>
1.1.4	$= \frac{(5^3)^{x+1} + 5^{3x}}{(5^2)^{\frac{3}{2}x}}$ $= \frac{5^{3x} \cdot 5^3 + 5^{3x}}{5^{3x}}$ $= \frac{5^{3x}(125 + 1)}{5^{3x}}$ $= 126$	\checkmark Prime Factors / <i>priemfaktore</i> \checkmark Power Rule / <i>magreël</i> \checkmark Common Factor / <i>gemene faktor</i> $\checkmark 126$	<p>A</p> <p>A</p> <p>CA</p> <p>CA (4)</p>

1.2.1	$\frac{\log 4 + \log 25}{\log 0,001}$ $= \frac{\log 4 \times 25}{\log 10^{-3}} \quad \text{OR / OF} \quad \frac{\log 2^2 + \log 5^2}{\log 10^{-3}}$ $= \frac{\log 100}{\log 10^{-3}} \quad \frac{2 \log 2 + 2 \log 5}{-3 \log 10}$ $= \frac{\log 10^2}{\log 10^{-3}} \quad \frac{2 \log 2 \times 5}{-3 \log 10}$ $= \frac{2 \log 10}{-3 \log 10} \quad \frac{2 \log 10}{-3 \log 10}$ $= -\frac{2}{3}$	$\checkmark \log 4 \times 25$ $\checkmark \log 10^{-3}$ $\checkmark \log 10^2$ $\checkmark -3 \log 10$ $\checkmark \frac{\log 10}{\log 10} = 1$	A A CA CA CA										
1.2.2	$\frac{4x-12}{x^2-9} \div \frac{2}{x+3} = 2$ $\frac{4(x-3)}{(x+3)(x-3)} \times \frac{x+3}{2}$ $= \frac{4}{2}$ $= 2$	$\checkmark 4(x-3)$ \checkmark Division Simplification / <i>deling vereenvoudiging</i> $\checkmark (x+3)(x-3)$ \checkmark Simplification / <i>vereenvoudiging</i>	A A A CA										
1.3.1	$\begin{array}{r} 1011 \\ \times 10 \\ \hline 0000 \\ +10110 \\ \hline 10110_2 \end{array}$ $R \times S = 10110_2$	\checkmark Method / <i>metode</i> $\checkmark 10110_2$	A CA										
1.3.2	<table border="1" style="margin-left: auto; margin-right: auto;"> <tbody> <tr> <td>16</td> <td>8</td> <td>4</td> <td>2</td> <td>1</td> </tr> <tr> <td>1</td> <td>0</td> <td>1</td> <td>1</td> <td>0</td> </tr> </tbody> </table> $16+4+2=22$	16	8	4	2	1	1	0	1	1	0	\checkmark Method / <i>metode</i> $\checkmark 22$	A CA
16	8	4	2	1									
1	0	1	1	0									
1.4.1	$r = \frac{0,4}{2} = 0,2 \text{ mm}$ $V = \frac{4}{3} \pi (0,2)^3$ $V = 0,01884 \text{ mm}^3$ $V \approx 0,02 \text{ mm}^3$	$\checkmark r = 0,2 \text{ mm}$ \checkmark Substitution / <i>vervangings</i> $\checkmark V = 0,02 \text{ mm}^3$	A CA CA										
1.4.2	$1,88 \times 10^{-2}$	$\checkmark 1,88 \times 10^{-2}$	CA (1)										
			[30]										

QUESTION / VRAAG 2		
2.1.1	$x^3 = 5^3$ $x = 5$	✓ Exponential form / <i>eksponensiële vorm</i> A ✓ $x = 5$ CA (2)
2.1.2	$x + \sqrt{x} - \sqrt{x} - 1 = 0$ $x - 1 = 0$ $x = 1$	✓ Expansion / <i>uitbreiding</i> A ✓ Simplification / <i>vereenvoudiging</i> CA ✓ $x = 1$ CA (3)
2.1.3	$\frac{3^{x-1} \cdot (3^2)^x}{3^{-x}} = 3^4$ $\frac{3^{x-1} \cdot 3^{2x}}{3^{-x}} = 3^4$ $3^{x-1+2x+x} = 3^4$ OR / OF $3^{x-1+2x} = 3^{-x+4}$ $3^{4x-1} = 3^4$ $x - 1 + 2x = -x + 4$ $4x - 1 = 4$ $4x = 5$ $4x = 5$ $x = \frac{5}{4}$ $x = \frac{5}{4}$	✓ 3^2 A ✓ 3^4 A ✓ 3^{4x-1} CA ✓ $4x-1=4$ CA ✓ $x = \frac{5}{4}$ CA (5)
2.1.4	$\log_x 4(x+3) = \log_2 4$ $\log_x 4(x+3) = \log_2 2^2$ $\log_x 4(x+3) = 2 \log_2 2$ $\log_x 4(x+3) = 2(1)$ $4x+12 = x^2$ $x^2 - 4x - 12 = 0$ $(x-6)(x+2) = 0$ OR / OF $x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(-12)}}{2(1)}$ $x = 6$ or/of $x = -2$ $x = 6$ or/of $x = -2$ $\therefore x = 6$	✓ $\log_2 2^2$ A ✓ Log property / <i>eienskap</i> A ✓ Same base rule / <i>dieselfde basis reël</i> CA ✓ $x^2 - 4x - 12 = 0$ CA ✓ $(x-6)(x+2) = 0$ CA ✓ $x = 6$ CA (6)
2.2.1	$F = BIl \sin \theta$ $\sin \theta = \frac{F}{BIl}$ $\theta = \sin^{-1} \left(\frac{F}{BIl} \right)$	✓ $\sin \theta = \frac{F}{BIl}$ A ✓ $\theta = \sin^{-1} \left(\frac{F}{BIl} \right)$ CA (2)
2.2.2	$\theta = \sin^{-1} \left(\frac{4,906}{(2,25)(9,8)(275 \times 10^{-3})} \right)$ $\theta = 54,01^\circ$	✓ Substitution / <i>vervanging</i> A ✓ $\theta = 54,01^\circ$ CA (2)
		[20]

QUESTION / VRAAG 3		
3.1.1	$2x(x-7)-20=0$ $2x^2-14x+20=0$ $x^2-7x+10=0$ $(x-5)(x-2)=0$ OR / OF $x = \frac{-(-14) \pm \sqrt{(-14)^2 - 4(2)(20)}}{2(2)}$ $x=5$ or/of $x=2$	✓ Standard form / <i>standaardvorm</i> A ✓ Factors/ Substitution / <i>faktore / vervanging</i> CA ✓ $x=5$ CA ✓ $x=2$ CA (4)
3.1.2	$-3x^2+2x+4=0$ $x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(-3)(4)}}{2(-3)}$ $x = \frac{-2 \pm 2\sqrt{13}}{-6}$ $x = -0,87$ or/of $x = 1,54$	✓ Standard form/ <i>standaardvorm</i> A ✓ Substitution/ <i>vervanging</i> CA ✓ $x = -0,87$ CA ✓ $x = 1,54$ CA (4)
3.1.3	Critical values / <i>Kritiese waardes</i> : 0 and/en -5  $x \leq -5$ or/of $x \geq 0$	✓ Critical values / <i>Kritiese waardes</i> A ✓ Number line / <i>getallemlyn</i> CA ✓ $x \leq -5$ CA ✓ $x \geq 0$ CA (4)
3.2	$2y-x-4=0$(1) $y+6x=x^2+8$(2) $y=x^2-6x+8$(2) $2(x^2-6x+8)-x-4=0$ $2x^2-12x+16-x-4=0$ $2x^2-13x+12=0$ $x = \frac{-(-13) \pm \sqrt{(-13)^2 - 4(2)(12)}}{2(2)}$ $x = \frac{13 \pm \sqrt{73}}{4}$ $x = 5,39$ or/of $x = 1,11$ $y = (5,39)^2 - 6(5,39) + 8$ or/of $y = (1,11)^2 - 6(1,11) + 8$ $y = 4,71$ or/of $y = 2,57$	✓ Subject / <i>onderwerp</i> A ✓ Substitution / <i>vervanging</i> CA ✓ Standard form / <i>standaardvorm</i> CA ✓ Substitution / <i>vervanging</i> CA ✓ Both x-values / <i>Beide x-waardes</i> CA ✓ Both y-values / <i>Beide y-waardes</i> CA

<p style="text-align: center;">OR / OF</p> $2y - x - 4 = 0 \dots\dots(1)$ $y + 6x = x^2 + 8 \dots\dots(2)$ $y = \frac{x}{2} + 2 \dots\dots(3)$ $\frac{x}{2} + 2 = x^2 - 6x + 8$ $x + 4 = 2x^2 - 12x + 16$ $2x^2 - 13x + 12 = 0$ $x = \frac{-(-13) \pm \sqrt{(-13)^2 - 4(2)(12)}}{2(2)}$ $x = \frac{13 \pm \sqrt{73}}{4}$ $x = 5,39 \text{ or/of } x = 1,11$ $y = (5,39)^2 - 6(5,39) + 8 \text{ or } y = (1,11)^2 - 6(1,11) + 8$ $y = 4,71 \text{ or } y = 2,57$	<p style="text-align: center;">OR / OF</p> <p>✓ Subject / <i>onderwerp</i> A</p> <p>✓ Equating equations / <i>gelykstellende vergelykings</i> CA</p> <p>✓ Standard form / <i>standaardvorm</i> CA</p> <p>✓ Substitution / <i>vervanging</i> CA</p> <p>✓ Both x-values / <i>beide x-waardes</i> CA</p> <p>✓ Both y-values / <i>beide y-waardes</i> CA</p>
<p style="text-align: center;">OR / OF</p> $2y - x - 4 = 0 \dots\dots(1)$ $y = x^2 - 6x + 8 \dots\dots(2)$ $x = 2y - 4 \dots\dots(3)$ $y = (2y - 4)^2 - 6(2y - 4) + 8$ $y = 4y^2 - 16y + 16 - 12y + 24 + 8$ $4y^2 - 29y + 48 = 0$ $y = \frac{-(-29) \pm \sqrt{(-29)^2 - 4(4)(48)}}{2(4)}$ $y = \frac{29 \pm \sqrt{73}}{8}$ $y = 4,69 \text{ or/of } y = 2,56$ $x = 2(4,69) - 4 \text{ or/of } x = 2(2,56) - 4$ $x = 5,38 \text{ or/of } x = 1,12$	<p style="text-align: center;">OR / OF</p> <p>✓ Subject / <i>onderwerp</i> A</p> <p>✓ Substitution / <i>vervanging</i> CA</p> <p>✓ Standard equation / <i>standaard vergelyking</i> CA</p> <p>✓ Substitution / <i>vervanging</i> CA</p> <p>✓ Both y-values / <i>beide y-waardes</i> CA</p> <p>✓ Both x-values / <i>beide x-waardes</i> CA</p> <p style="text-align: right;">(6)</p>

QUESTION / <i>VRAAG 4</i>			
4.1.1	$p = 0$ or/of $p = -4$	$\checkmark p = 0$ $\checkmark p = -4$	A A (2)
4.1.2	$p + 4 < 0$ $p < -4$	$\checkmark p + 4 < 0$ $\checkmark p < -4$	A A (2)
4.2	$\Delta = b^2 - 4ac$ $\Delta = (-5)^2 - 4(1)(1)$ $\Delta = 21$ \therefore The roots are real, irrational and unequal / <i>Die wortels is reël, irrasionaal en ongelyk</i>	\checkmark Substitution / <i>vervanging</i> $\checkmark \Delta = 21$ \checkmark Nature of roots / <i>aard van die wortels</i>	A CA CA (3)
4.3	$\Delta = 0$ $(1)^2 - 4(-1)(c) = 0$ $1 + 4c = 0$ $c = -\frac{1}{4}$	$\checkmark \Delta = 0$ \checkmark Substitution / <i>vervanging</i> $\checkmark c = -\frac{1}{4}$	A CA CA (3)
			[10]

QUESTION / VRAAG 5			
5.1	$C(0;8)$	$\checkmark 0$ $\checkmark 8$	A A (2)
5.2	$q = 8$ $x = \frac{-b}{2a}$ $3 = \frac{-b}{2(1)}$ $-b = 6$ $b = -6$ $\therefore f(x) = x^2 - 6x + 8$	$\checkmark q = 8$ \checkmark Substitution / <i>vervang</i> $\checkmark b = -6$	A A CA (3)
5.3	$3 = \frac{x_B + 2}{2}$ $x_B + 2 = 6$ $x_B = 6 - 2$ $x_B = 4$ $B(4;0)$ OR/OF $x^2 - 6x + 8 = 0$ $(x - 2)(x - 4) = 0$ $x = 2$ or $x = 4$ $B(4;0)$	\checkmark Substitution / <i>vervang</i> \checkmark Simplification / <i>vereenvoudig</i> $\checkmark (4;0)$ OR / OF \checkmark Substituting / <i>vervang 0</i> \checkmark Factorisation/ Substitution / <i>faktorisering / vervang</i> $\checkmark (4;0)$	A CA CA A CA (3)
5.4	$f(3) = (3)^2 - 6(3) + 8$ $f(3) = -1$ Minimum value / <i>waarde</i> is -1	\checkmark Substitution by 3 / <i>vervang deur 3</i> $\checkmark f(3) = -1$	A CA (2)

<p>5.5</p>	$\frac{-x}{2} + 8 = x^2 - 6x + 8$ $-x + 16 = 2x^2 - 12x + 16$ $2x^2 - 12x + x + 16 - 16 = 0$ $2x^2 - 11x = 0$ $x(2x - 11) = 0$ $x = 0 \text{ or/of } x = \frac{11}{2}$ $f(0) = (0)^2 - 6(0) + 8$ $f(0) = 8$ $f\left(\frac{11}{2}\right) = \left(\frac{11}{2}\right)^2 - 6\left(\frac{11}{2}\right) + 8$ $f\left(\frac{11}{2}\right) = \frac{21}{4}$ $(0; 8) \text{ and/en } \left(\frac{11}{2}; \frac{21}{4}\right)$	<p>✓ $f(x) = g(x)$ A</p> <p>✓ Standard form / <i>standaardvorm</i> A</p> <p>✓ Factors / <i>faktore</i> CA</p> <p>✓ Both x-values / <i>beide x-waardes</i> CA</p> <p>✓ Both y-values / <i>beide y-waardes</i> CA</p> <p>(5)</p>
<p>5.6</p>	<p>(3 ; -4)</p>	<p>✓ $x = 3$ A</p> <p>✓ $y = -4$ A</p> <p>(2)</p>
		<p>[17]</p>

QUESTION / VRAAG 6		
6.1	$h(0) = \left(\frac{1}{5}\right)^0 - 1$ $h(0) = 0$ $(0; 0)$	✓ Substitution by / <i>vervanging deur 0</i> A ✓ $h(0) = 0$ CA (2)
6.2	$y = -1$	✓ $y = -1$ A (1)
6.3	$(0; 3)$	✓ $(0; 3)$ A (1)
6.4		$k(x)$: ✓ Shape / vorm A ✓ Both intercepts / beide <i>afsnitte</i> CA $h(x)$: ✓ Shape / vorm A ✓ Asymptote / <i>asimptoot</i> A ✓ y -intercept / y - <i>afsnit</i> A (5)
6.5	$x \leq 0$ or/of $x \in (-\infty; 0]$	✓ Critical values / <i>kritiese</i> <i>waardes</i> A ✓ Notation / <i>notasie</i> A (2)
6.6	$0 \leq y \leq 3$ or/of $y \in [0; 3]$	✓ Critical values / <i>kritiese</i> <i>waardes</i> A ✓ Notation / <i>notasie</i> A (2)
6.7	$k(x) = \left(\frac{1}{5}\right)^{-x} - 1$ $k(x) = 5^x - 1$	✓ $k(x) = \left(\frac{1}{5}\right)^{-x} - 1$ A (1)
		[15]

QUESTION /VRAAG 7			
7.1	$x = 0$ $y = -1$	✓ $x = 0$ ✓ $y = -1$	A A (2)
7.2	$f(x) = \frac{m}{x} - 1$ $0 = \frac{m}{1} - 1$ $1 = m$	✓ Substituting asymptotes / <i>vervang asimptote</i> ✓ Substituting / <i>vervang</i> (0 ;1) ✓ $m = 1$	A CA CA (3)
7.3	$y = \pm x - 1$	✓ Positive equation / <i>Positiewe vergelyking</i> ✓ Negative equation / <i>Negatiewe vergelyking</i>	CA CA (2)
7.4	$y \in \mathbb{R}, y \neq -1$ OR / OF $-\infty < y < -1$ or $-1 < y < \infty$	✓ $y \in \mathbb{R}$ ✓ $y \neq -1$	A A (2)
7.5	$x < 0$ or / <i>of</i> $x > 1$	✓ $x < 0$ ✓ $x > 1$	 (2)
7.6	A (1;0) \longrightarrow Ax (-1;0)	✓ $x = -1$ ✓ $y > 0$	 (2)
			[13]

QUESTION / VRAAG 8			
8.1	$i_{eff} = \left(1 + \frac{i}{m}\right)^m - 1$ $i_{eff} = \left(1 + \frac{0,098}{365}\right)^{365} - 1$ $i_{eff} = 0,10294827704 \times 100$ $i_{eff} = 10,29\%$	✓ Formula / <i>formule</i> ✓ Substitution / <i>vervanging</i> ✓ $i_{eff} = 10,29\%$	A CA CA (3)
8.2.1	$\frac{35,71}{100} \times R28\ 000 = R9\ 998,80$	✓ Answer / <i>antwoord</i>	A (1)
8.2.2	$R30\ 000 - R9\ 998,80 = R20\ 001,20$	✓ R30 000 – R9 998,80 ✓ R20 001,20	A CA (2)
8.3	$A = P(1 + in)$ $2P = P(1 + i.7)$ $2 = 1 + 7i$ $7i = 1$ $i = \frac{1}{7} \times 100$ $i = 14,29\%$	✓ Formula / <i>formule</i> ✓ Substitution / <i>vervanging</i> ✓ $i = 14,29\%$	A CA CA (3)

<p>8.4</p>	$A = P(1+i)^n$ $A = \left(R75\,000 \left(1 + \frac{0,062}{4} \right)^{4 \times 1} + R6\,000 \right) \left(1 + \frac{0,08}{12} \right)^{12 \times 5} - \dots$ $R10\,000 \left(1 + \frac{0,08}{12} \right)^{12 \times 3}$ $A = R1\,150\,565,66$ <p style="text-align: center;">OR / OF</p> $A = P(1+i)^n$ $A = R75\,000 \left(1 + \frac{0,062}{4} \right)^{4 \times 1} \left(1 + \frac{0,08}{12} \right)^{12 \times 5}$ $+ R6\,000 \left(1 + \frac{0,08}{12} \right)^{12 \times 5} - R10\,000 \left(1 + \frac{0,08}{12} \right)^{12 \times 3}$ $A = R1\,150\,565,66$	<p>✓ Formula / <i>formule</i> A</p> <p>✓ $75000 \left(1 + \frac{0,062}{4} \right)$ A</p> <p>✓ $n = 4$ A</p> <p>✓ $+R6\,000$ A</p> <p>✓ $\left(1 + \frac{0,08}{12} \right)^{12 \times 5}$ A</p> <p>✓ $- R10\,000$ A</p> <p>✓ $\left(1 + \frac{0,08}{12} \right)^{12 \times 3}$ A</p> <p>✓ Amount / <i>bedrag</i> CA</p> <p style="text-align: center;">OR / OF</p> <p>✓ Formula / <i>formule</i> A</p> <p>✓ $75000 \left(1 + \frac{0,062}{4} \right)$ A</p> <p>✓ $n = 4$ A</p> <p>✓ $\left(1 + \frac{0,08}{12} \right)$ A</p> <p>✓ $n = 60$ A</p> <p>✓ $+R6\,000 \left(1 + \frac{0,08}{12} \right)^{12 \times 5}$ CA</p> <p>✓ $-10\,000 \left(1 + \frac{0,08}{12} \right)^{12 \times 3}$ CA</p> <p>✓ $A = R1\,150\,565,66$ CA</p>
		(8)
		[17]
		TOTAL/TOTAAL: 150