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basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE
NASIONALE
SENIOR SERTIFIKAAT**

GRADE 12/GRAAD 12

TECHNICAL MATHEMATICS P1/TEGNIJSE WISKUNDE V1

NOVEMBER 2025

MARKING GUIDELINES/NASIENRIGLYNE

MARKS/PUNTE: 150

MARKING CODES/NASIENKODES	
A	Accuracy/Akkuraatheid
AO	Answer only/Slegs antwoord
CA	Consistent accuracy/Volgehoue akkuraatheid
F	Formula/Formule
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

These marking guidelines consist of 18 pages.


Hierdie nasienriglyne bestaan uit 18 bladsye.

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- NOTE:**
- If a candidate answers a question TWICE, mark only the FIRST attempt.
 - Consistent accuracy (CA) applies in all aspects of the marking guidelines where indicated.

- LET WEL:**
- Indien 'n kandidaat 'n vraag TWEE keer beantwoord, sien slegs die EERSTE poging na.
 - Volgehoue akkuraatheid (CA) is deurgaans op alle aspekte van die nasienriglyne van toepassing waar aangedui.

QUESTION/VRAAG 1

1.1.1	$2x\left(x - \frac{4}{9}\right) = 0$ $x = 0 \text{ or / of } \frac{4}{9}$	$\checkmark 0$ $\checkmark \frac{4}{9}$	A A (2)
1.1.2	$6 + (2x - 5)(x + 2) = 0$ $6 + 2x^2 - x - 10 = 0$ $2x^2 - x - 4 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-1) \pm \sqrt{(-1)^2 - 4(2)(-4)}}{2(2)}$ $\therefore x \approx 1,69 \text{ or / of } x \approx -1,19$	\checkmark product/produkt \checkmark std form/vorm \checkmark SF \checkmark both each x - values/ beide x -waardes	A CA CA CA (4)
1.1.3	$(3 - x)(x + 2) > 0$ <p>Critical values/Kritieke waardes: 3 and/en -2</p> $\therefore -2 < x < 3 \text{ OR/OF } x \in (-2;3) \text{ OR/OF}$ $x > -2 \text{ and/en } x < 3$ <p>OR/OF</p> 	\checkmark both critical values/ kritieke waardes \checkmark correct notation/ korrekte notasie	A A A (2)



1.3.1	$BP = 2\pi NT$ $N = \frac{BP}{2\pi T}$	✓ dividing/deling	A (1)
1.3.2	$N = \frac{BP}{2\pi T}$ $= \frac{117\,366,54}{2\pi(560,44)}$ $\approx 33,33 \text{ r/s}$ <p style="text-align: center;">OR/OF</p> $BP = 2\pi NT$ $117\,366,54 = 2\pi N(560,44)$ $N \approx 33,33 \text{ r/s}$	✓ SF ✓ S OR/OF ✓ SF ✓ S	CA CA A CA (2)
1.4	$81 = 1010001_2$	✓ 1010001_2	A (1)
1.5	$81 \div 11011_2$ $= 81 \div 27$ $= 3$	✓ 27 ✓ 3 AO: Full marks/ Volpunte	CA CA (2)
			[20]



QUESTION/VRAAG 2

2.1.1	$\Delta = b^2 - 4ac$	✓ discriminant formula/ <i>diskriminant formule</i>	A (1)
2.1.2	$\Delta = b^2 - 4ac$ $= (-2)^2 - 4(1)(2)$ $= -4$	✓ SF ✓ discriminant/ <i>diskriminant</i>	A CA (2)
2.1.3	Roots are non-real OR imaginary/ <i>Wortels is nie-reële</i> OF <i>imaginêr</i>	✓ non-real/ <i>nie-reële</i>	A (1)
2.2	$x^2 + 2x - 4 = m$ $x^2 + 2x - 4 - m = 0$ $\Delta = b^2 - 4ac$ $(2)^2 - 4(1)(-4 - m) = 0$ $20 + 4m = 0$ $m = -5$	✓ standard form/ standaardvorm ✓ SF ✓ $\Delta = 0$ ✓ value of/ <i>waarde van m</i>	CA CA A CA (4)
			[8]



QUESTION/VRAAG 3

3.1.1	$\sqrt[3]{27 p^{12}}$ $= 3 p^4$	✓ 3 ✓ p^4	A A (2)
3.1.2	$\frac{3 \times 2^x}{2^{x+2} - 2^x}$ $= \frac{3 \times 2^x}{2^x \cdot 2^2 - 2^x} \quad \text{OR/ OF} \quad = \frac{3 \times 2^x}{4 \cdot 2^x - 2^x}$ $= \frac{3 \times 2^x}{2^x (4 - 1)} \quad = \frac{3 \cdot 2^x}{3 \cdot 2^x}$ $= 1$	✓ product/ <i>produk</i> ✓ common factor/ <i>gemene faktor</i> / subtract like terms/ <i>verskil tussen gelyksoortige terme</i>	A CA CA (3)
3.2.1	$a^{\frac{1}{2}}$	✓ S	A (1)
3.2.2	$2 \log_a a^{\frac{1}{2}}$ $= 2 \times \frac{1}{2} \log_a a$ $= 1$	✓ log law/prop./ <i>log-wet/eienskap</i> ✓ 1	A CA (2)
3.3.1	$\log 27$ $= \log 3^3$ $= 3 \log 3$ $= 3q$	✓ exp.prop./ <i>eksp.eienskap</i> ✓ S	A CA (2)
3.3.2	$\log 60$ $= \log(2 \times 3 \times 10)$ $= \log 2 + \log 3 + \log 10$ $= p + q + 1$	✓ log prop. ✓ $p + q$ ✓ 1	A CA CA (3)



3.4	$\log_3 x + \log_3(x + 2) = 1$ $\log_3 x(x + 2) = 1$ $\log_3(x^2 + 2x) = \log_3 3$ OR/OF $x^2 + 2x = 3^1$ $x^2 + 2x - 3 = 0$ $(x + 3)(x - 1) = 0$ $x = -3$ or / of $x = 1$ $\therefore x = 1$	\checkmark log prop./ log-wet A \checkmark log property/ log. eienskap CA \checkmark standard form/ <i>standaardvorm</i> CA \checkmark $x \neq -3$ CA \checkmark $x = 1$ CA (5)
3.5.1	$V = r \text{ cis } \theta$ $V = 2 \text{ cis } 120^\circ$	\checkmark sub./ vervang A (1)
3.5.2	$V = 2(\cos 120^\circ + i \sin 120^\circ)$ $V = -1 + \sqrt{3}i$	\checkmark real CA \checkmark imaginary CA (2)
3.6	$a + 7bi = -21i^2 + 21i$ $a + 7bi = -21(-1) + 21i$ $a + 7bi = 21 + 21i$ $\therefore a = 21$ and/en $\therefore b = 3$	\checkmark $i^2 = -1$ A \checkmark $a = 21$ CA \checkmark $b = 3$ A (3)
		[24]



QUESTION 4/VRAAG 4

4.1.1	$x = 0$ $y = 3$	✓ $x = 0$ ✓ $y = 3$	A A (2)
4.1.2	$x \in \mathbb{R}; x \neq 0$ <p style="text-align: center;">OR/OF</p> $x \in (-\infty; 0) \cup (0; \infty)$	✓ $x \in \mathbb{R}; x \neq 0$	A (1)
4.1.3	y -int:/ y -afsnit: $y = 3$ x -int:/ x -afsnit: $0 = 3x + 3$ $\therefore x = -1$	✓ y -intercept/ y afsnit ✓ x -intercept/ x -afsnit	A A (2)
4.1.4	$f(x) = \frac{3}{x} + 3$ $0 = \frac{3}{x} + 3$ $\therefore x = -1$	✓ $f(x) = 0$ ✓ $x = -1$	A CA (2)
4.1.5		<p>For/Vir f :</p> ✓ shape of f / vorm van f ✓ both asymptotes/ beide <i>assimptote</i> ✓ intercept of f / afsnit van f <p>For/Vir g :</p> ✓ shape of g / vorm van g ✓ both intercepts of g / beide afsnitte van g	A CA CA A CA (5)



4.1.6	$-1 \leq x < 0$ <p style="text-align: center;">OR/OF</p> $x \geq -1$ and / en $x < 0$ <p style="text-align: center;">OR/OF</p> $x \in [-1; 0)$	✓ critical values/ <i>kritieke waardes</i> CA ✓ notation/notasie A	(2)
4.2.1	$x = -1$	✓ $x = -1$	A
4.2.2	B(2; 0)	✓ 2 CA ✓ 0 A	(2)
4.2.3	$f(x) = -(x+1)^2 + q$ Subst: A(-4;0): OR/OF Subst: B(2;0): $\therefore 0 = -(-4+1)^2 + q$ $\therefore 0 = -(2+1)^2 + q$ $\therefore 0 = -9 + q$ $\therefore q = 9$ OR/OF $f(x) = -(x+4)(x-2)$ $= -x^2 - 2x + 8$ $f(-1) = -(-1)^2 - 2(-1) + 8$ OR/OF $q = \frac{4(-1)(8) - (-2)^2}{4(-1)}$ $\therefore q = 9$	✓ subst. the value of p / <i>vervanging van p</i> A ✓ substitute A or B/ <i>vervang A of B</i> CA ✓ value of/ <i>waarde van q</i> CA <p style="text-align: center;">OR/OF</p> ✓ subst. the x -intercepts A ✓ subst. the value of p / <i>vervanging van p</i> CA ✓ value of/ <i>waarde van q</i> CA	(3)



4.2.4	$y \leq 9$ OR/OF $y \in (-\infty ; 9]$ OR/OF $-\infty < y \leq 9$	✓ correct interval	CA (1)
4.2.5	$y = 6$	✓ $y = 6$	A (1)
4.2.6	$g(x) = a^x + 6$ Subst / Vervang $C(-1;9)$: $9 = a^{-1} + 6$ $3 = \frac{1}{a}$ $a = \frac{1}{3}$ $g(x) = \left(\frac{1}{3}\right)^x + 6$ OR/OF $g(x) = 3^{-x} + 6$	✓ substitute C / vervang C ✓ value of / waarde van a	CA CA (2)
			[24]



QUESTION/VRAAG 5

5.1.1	$A = P(1 - in)$	✓ F	A (1)
5.1.2	$A = P(1 - in)$ $= 4\,990 [1 - (0,0589 \times 7)]$ $= \approx R2\,932,62$	✓ SF ✓ S	A CA (2)
5.2	$A = P(1 + i)^n$ $= R\,32\,000(1 + 0,0715)^4$ $\approx R\,42\,181,18$	✓ F ✓ SF ✓ S	A A CA (3)
5.3.1	$5\,000 \times \frac{1}{2} = 2\,500$ litres/liter	✓ litres/liter	A (1)
5.3.2	$A = P(1 - i)^n$ $2\,500 = 5\,000(1 - i)^{35}$ $\frac{2\,500}{5\,000} = (1 - i)^{35}$ $\sqrt[35]{\frac{2\,500}{5\,000}} = 1 - i$ $i = 1 - \sqrt[35]{\frac{2\,500}{5\,000}}$ $i = 0,0196... \text{ OR/ OF } r \approx 1,96...\%$	✓ F ✓ SF ✓ make i the subject/ <i>maak i die onderwerp</i> ✓ decimal value of i OR r / <i>desimale waarde van i OF r</i> NPR	A A CA CA (4)
5.3.3	$A = P(1 - i)^n$ $= 5\,000(1 - 0,0196...)^{60}$ $\approx 1\,524,64$ litres/liter \therefore Yes, more than 1 500 litres will be left in the tank/ Ja, meer as 1 500 liter sal in die tenk oor wees.	✓ $n = 60$ ✓ SF ✓ S ✓ conclusion/gevolgtrekking	A CA CA CA (4)
			[15]



QUESTION/VRAAG 6

6.1	$f(x) = 4 + \frac{1}{3}x$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{4 + \frac{1}{3}(x+h) - \left(4 + \frac{1}{3}x\right)}{h}$ $= \lim_{h \rightarrow 0} \frac{4 + \frac{1}{3}x + \frac{1}{3}h - 4 - \frac{1}{3}x}{h}$ $= \lim_{h \rightarrow 0} \frac{\frac{1}{3}h}{h}$ $= \lim_{h \rightarrow 0} \left(\frac{1}{3}\right)$ $\therefore f'(x) = \frac{1}{3}$	<p>✓ definition/definisie A</p> <p>✓ SF A</p> <p>✓ S CA</p> <p>✓ S CA</p> <p>✓ $\frac{1}{3}$ CA (5)</p>
6.2.1	$y = -3x^{6-4}$ $y = -3x^2$	<p>✓ S A (1)</p>
6.2.2	$\frac{dy}{dx} = -6x$	<p>✓ $-6x$ CA (1)</p>
6.3.1	$D_x [5x^8 - 11]$ $= 40x^7$	<p>✓ $40x^7$ A</p> <p>✓ 0 (Implied/Aanvaar) A (2)</p>
6.3.2	$\frac{d}{dx} \left(-\frac{10}{x} \right)$ $= \frac{d}{dx} (-10x^{-1})$ $= 10x^{-2}$	<p>✓ $10x^{-1}$ A</p> <p>✓ $10x^{-2}$ CA (2)</p>



6.3.3	$f(x) = -\frac{4x}{3} + \sqrt[4]{x^{-5}}$ $= -\frac{4x}{3} + x^{-\frac{5}{4}}$ $f'(x) = -\frac{4}{3} - \frac{5}{4}x^{-\frac{9}{4}}$	$\checkmark x^{-\frac{5}{4}}$ $\checkmark -\frac{4}{3}$ $\checkmark -\frac{5}{4}x^{-\frac{9}{4}}$	A A CA (3)
6.4.1	$y = 100 + 15x$ $\therefore m = 15$	$\checkmark m = 15$	A (1)
6.4.2	$y = 100 + 15x$ $25 = 100 + 15x$ $\therefore x = -5$ $h'(x) = 3ax^2 + 12x = 15$ $h'(-5) = 3a(-5)^2 + 12(-5) = 15$ $75a = 75$ $\therefore a = 1$	\checkmark subst./vervang $y = 25$ $\checkmark x = -5$ \checkmark derivative/afgeleide $\checkmark h'(-5) = 15$ \checkmark value of a /waarde van a	A CA A CA CA (5)
			[20]



QUESTION/VRAAG 7

7.1	$y = 20$	✓ $y = 20$	A (1)
7.2	$g(5) = 0$ $a(5)^3 - 2(5)^2 - 19(5) + 20 = 0$ $125a = 125$ $a = 1$	✓ equating to 0/ <i>vervangings en gelykstel aan 0</i> ✓ Substitution/ <i>vervangings</i>	A A (2)
7.3	$x^3 - 2x^2 - 19x + 20 = 0$ $(x - 5)(x^2 + 3x - 4) = 0$ $(x - 5)(x - 1)(x + 4) = 0$ $\therefore x = 5$ or / of $x = 1$ or / of $x = -4$ OR/OF $(x + 4)(x^2 - 6x + 5) = 0$ $(x + 4)(x - 1)(x - 5) = 0$ $\therefore x = -4$ or / of $x = 1$ or / of $x = 5$ OR/OF $(x - 1)(x^2 - x - 20) = 0$ $(x - 1)(x - 5)(x + 4) = 0$ $\therefore x = 1$ or / of $x = 5$ or / of $x = -4$	✓ M ✓✓✓ <i>x-intercepts/afsnitte</i> OR/OF ✓ M ✓✓✓ <i>x-intercepts/afsnitte</i> OR/OF ✓ M ✓✓✓ <i>x-intercepts/afsnitte</i> AO Full marks/Volpunte	A CA A CA A CA (4)
7.4	$g'(x) = 3x^2 - 4x - 19 = 0$ $x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(3)(-19)}}{2(3)}$ $x = 3,27$ or / of $x = -1,94$ $g(3,27) = (3,27)^3 - 2(3,27)^2 - 19(3,27) + 20$ $\approx -28,55$ $g(-1,94) = (-1,94)^3 - 2(-1,94)^2 - 19(-1,94) + 20$ $\approx 42,03$ $\therefore (3,27 ; -28,55)$ or / of $(-1,94 ; 42,03)$	✓ derivative/ <i>afgeleide</i> ✓ equating derivative to 0/ <i>stel afgeleide gelyk aan 0</i> ✓ factors/formula/ <i>faktore/formule</i> ✓ both values of/ <i>beide waardes van x</i> ✓ both values of/ <i>beide waardes van y</i>	A A CA CA CA (5)



<p>7.5</p>		<ul style="list-style-type: none"> ✓ <i>y</i>-intercept/<i>afsnit</i> CA ✓ all <i>x</i>-intercepts/ <i>alle x</i>-<i>afsnitte</i> CA ✓ both turning points/<i>beide</i> <i>draaipunte</i> CA ✓ shape/<i>vorm</i> CA
		<p>(4)</p>
		<p>[16]</p>



QUESTION/VRAAG 9

9.1.1	$\int x^3 dx$ $= \frac{x^4}{4} + C$	$\checkmark \frac{x^4}{4}$ $\checkmark C$	A A (2)
9.1.2	$\int \left[2^{3x} + \frac{1}{x^2}(x-2) \right] dx \text{ OR/OF } \int [2^{3x} + x^{-2}(x-2)] dx$ $= \int \left[2^{3x} + \frac{1}{x} - \frac{2}{x^2} \right] dx$ $= \int 2^{3x} + \frac{1}{x} - 2x^{-2} dx \text{ OR/OF } \int 2^{3x} + x^{-1} - 2x^{-2} dx$ $= \frac{2^{3x}}{3 \ln 2} + \ln x - \left(\frac{2x^{-1}}{-1} \right) + C$ $= \frac{2^{3x}}{3 \ln 2} + \ln x + 2x^{-1} + C$	$\checkmark S$ $\checkmark -2x^{-2}$ $\checkmark \frac{2^{3x}}{3 \ln 2}$ $\checkmark + \ln x$ $\checkmark + 2x^{-1} + C$	A CA A CA CA (5)



9.2	<p>$f(x) = -2x^2 + 8x = 0$</p> <p>A: Shaded area from/Skakeerde area van $x = 0$ to $x = 1$</p> $A_A = \int_0^1 (-2x^2 + 8x) dx$ $= \left[-\frac{2}{3}x^3 + 4x^2 \right]_0^1$ $= \left[-\frac{2}{3}(1)^3 + 4(1)^2 \right] - \left[-\frac{2}{3}(0)^3 + 4(0)^2 \right]$ $= \frac{10}{3} \text{ units}^2 / \text{eenhede}^2$ <p>B: Unshaded area from/ Onskakeerde area van $x = 1$ to $x = 4$</p> $A_B = \int_1^4 (-2x^2 + 8x) dx$ $= \left[-\frac{2}{3}x^3 + 4x^2 \right]_1^4$ $= \left[-\frac{2}{3}(4)^3 + 4(4)^2 \right] - \left[-\frac{2}{3}(1)^3 + 4(1)^2 \right]$ $= \frac{64}{3} - \frac{10}{3}$ $= 18 \text{ units}^2 / \text{eenhede}^2$ <p style="text-align: center;">OR/OF</p> <p>A + B: Shaded area/ Skakeerde area van + Unshaded area Onskakeerde area van $x = 0$ to $x = 4$</p> $A_{A+B} = \int_0^4 (-2x^2 + 8x) dx$ $= \left[-\frac{2}{3}x^3 + 4x^2 \right]_0^4$ $= \left[-\frac{2}{3}(4)^3 + 4(4)^2 - 0 \right]$ $= \frac{64}{3}$ $\therefore A_B = \frac{64}{3} - \frac{10}{3} = 18 \text{ units}^2 / \text{eenhede}^2$ <p>Ratio/Verhouding:</p> $\frac{A}{B} = \frac{\left(\frac{10}{3}\right)}{18} = 0,1851$ <p>The ratio is less than 0,2 / Die verhouding is minder as 0,2 .</p>	<p>✓ area notation/ area notasie A</p> <p>✓ $\frac{2}{3}x^3 + 4x^2$ A</p> <p>✓ SF CA</p> <p>✓ $\frac{10}{3} \text{ units}^2 / \text{eenhede}^2$ CA</p> <p>✓ SF CA</p> <p>✓ $18 \text{ units}^2 / \text{eenhede}^2$ CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ SF CA</p> <p>✓ $18 \text{ units}^2 / \text{eenhede}^2$ CA</p> <p>✓ ratio/verhouding CA</p> <p>✓ conclusion/ gevolgtrekking CA (8)</p>
		[15]

