basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIOR CERTIFICATE EXAMINATIONS/
NATIONAL SENIOR CERTIFICATE EXAMINATIONS
SENIORSERTIFIKAAT-EKSAMEN/
NASIONALE SENIORSERTIFIKAAT-EKSAMEN

TECHNICAL MATHEMATICS P1/*TEGNIESE WISKUNDE V1*

MAY/JUNE/*MEI/JUNIE* 2026

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 24 pages.
Hierdie nasienriglyne bestaan uit 24 bladsye.

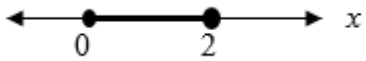
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NOTE:
- If a candidate answers a question TWICE, mark only the FIRST attempt.
- If a candidate cancels out an answer and does not attempt the question again, mark the cancelled out work.
- Consistent accuracy (CA) applies in all aspects of the marking guidelines where indicated.

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

QUESTION/*VRAAG* 1

1.1.1	$x^2 - 8x = 0$ $x(x-8) = 0$ **OR/*OF*** $x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(1)(0)}}{2(1)}$ $x = 0$ or/*of* $x = 8$	✓ factors/*faktore*/**SF** ✓ both values of x *beide waardes van x* **AO: Full Marks/ *Volpunte***	**A** **CA** (2)
1.1.2	$4 + x^2 + 3x = 5$ $x^2 + 3x - 1 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(3) \pm \sqrt{(3)^2 - 4(1)(-1)}}{2(1)}$ $x \approx -3{,}30$ or/*of* $x \approx 0{,}30$	✓ std. form /*vorm* ✓ **SF** ✓ value of x/ *waarde v x* ✓ value of x/ *waarde van x* **NPR**	**A** **CA** **CA** **CA** (4)

1.1.3	$-x(x-2) \geq 0$ $0 \leq x \leq 2$ **OR/OF** $x \in [0\,;2]$ **OR/*OF*** $x \geq 0$ and / *en* $x \leq 2$ **OR/*OF***  **OR/*OF*** *x* values from 0 to 2 / *x waardes vanaf* 0 *tot* 2	✓ critical values/ *kritieke waardes* **A** ✓ correct notation *korrekte notasie* **A** **OR/*OF*** ✓ critical values/ *kritieke waardes* **A** ✓ correct notation *korrekte notasie* **A** **OR/*OF*** ✓ critical values/ *kritieke waardes* **A** ✓ correct notation *korrekte notasie* **A** **OR/*OF*** ✓ critical values/ *kritieke waardes* **A** ✓ correct wording *korrekte bewoording* **A** (2)
1.2.1	$y + 2 = 2x$ $y = 2x - 2$	✓ *y* subject of formula / *y onderwerp van formule* **A** (1)

1.2.2	$y = 2x - 2$ $2x^2 = 2 - y^2$ **OR/*OF*** $2x^2 + y^2 - 2 = 0$ $2x^2 = 2 - (2x - 2)^2$ **OR/*OF*** $2x^2 + (2x - 2)^2 - 2 = 0$ $6x^2 - 8x + 2 = 0$ $3x^2 - 4x + 1 = 0$ $(3x - 1)(x - 1) = 0$ **OR/*OF*** $x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(3)(1)}}{2(3)}$ $x = \frac{1}{3} \approx 0,33$ or/*of* $x = 1$ $y = 2\left(\frac{1}{3}\right) - 2 = -\frac{4}{3} \approx -1,33$ or/*of* $y = 2(1) - 2 = 0$	✓ subst./ *vervang* **CA** ✓ std. form /*vorm* **CA** ✓ factors/*faktore*/**SF** **CA** ✓ both x-values / *beide x-waardes* **CA** ✓ both y-values / *beide y-waardes* **CA**
	OR/*OF*	**OR/*OF***
	$y + 2 = 2x$ $x = \frac{y}{2} + 1$ $2x^2 = 2 - y^2$ $2\left(\frac{y}{2} + 1\right)^2 = 2 - y^2$ $3y^2 + 4y = 0$ $y(3y + 4) = 0$ **OR/*OF*** $y = \frac{-(4) \pm \sqrt{(4)^2 - 4(3)(0)}}{2(3)}$ $y = -\frac{4}{3} \approx -1,33$ or/*of* $y = 0$ $x = \frac{\frac{-4}{3}}{2} + 1 = \frac{1}{3} \approx 0,33$ or/*of* $x = \frac{0}{2} + 1 = 1$	✓ subst./ *vervang* **A** ✓ std. form /*vorm* **CA** ✓ factors/*faktore*/**SF** **CA** ✓ both y-values / *beide y-waardes* **CA** ✓ both x-values / *beide x-waardes* **CA**

	OR/*OF*	**OR/*OF***	
	Making y the subject / *Maak y die onderwerp* $2x^2 = 2 - y^2$ $y^2 = 2 - 2x^2$ $y = \pm\sqrt{2 - 2x^2}$		
	$\therefore 2x - 2 = \pm\sqrt{2 - 2x^2}$ $(2x-2)^2 = 2 - 2x^2$ $4x^2 - 8x + 4 = 2 - 2x^2$ $6x^2 - 8x + 2 = 0$ $3x^2 - 4x + 1 = 0$	✓ Equating/ *vergelyk*	**A**
	$(x-1)(3x-1) = 0$ **OR / *OF*** $x = \dfrac{-(-4) \pm \sqrt{(-4)^2 - 4(3)(1)}}{2(3)}$	✓ std. form /*vorm* ✓ factors/*faktore*/**SF**	**CA** **CA**
	$x = 1$ *or / of* $x = \dfrac{1}{3} \approx 0,33$ $y = 0$ *or / of* $y = -\dfrac{4}{3} \approx -1,33$	✓ both x-values / *beide x-waardes* ✓both y-values / *beide y-waardes*	**CA** **CA**
			(5)

1.3.1	$V = I \times Z$ $Z = \frac{V}{I}$	✓ subject/ *onderwerp*	**A** (1)
1.3.2.a	$-3i$ **OR/*OF*** $0 - 3i$	✓ conjugate/ *konjugeerde*	**A** (1)
1.3.2.b	$Z = \frac{V}{I}$ **OR/*OF*** $V = I \times Z$		
	$= \frac{4-3i}{3i}$ **OR/*OF*** $4 - 3i = 3i \times z$	✓ **SF**	**CA**
	$= \frac{4-3i}{3i} \times \frac{-3i}{-3i}$ **OR/*OF*** $\frac{4-3i}{3i} \times \frac{i}{i}$ **OR/*OF*** $\frac{4-3i}{3i} \times \frac{3i}{3i}$	✓multiply by conjugate/ *vermenigvuldig met konjugeerde*	**CA**
	$= \frac{-12i + 9i^2}{-9i^2}$ **OR/*OF*** $\frac{4i - 3i^2}{3i^2}$ **OR/*OF*** $\frac{12i - 9i^2}{9i^2}$		
	$= \frac{-12i + 9(-1)}{-9(-1)}$ **OR/*OF*** $\frac{4i - 3(-1)}{3(-1)}$ **OR/*OF*** $\frac{12i - 9(-1)}{9(-1)}$	✓ $i^2 = -1$	**A**
	$= -1 - \frac{4i}{3}$ **OR/*OF*** $-1 - 1{,}33i$	✓ complex number/ *komplekse getal*	**CA**
	OR/*OF*		
	$Z = \frac{V}{I}$		
	$= \frac{5 \text{ cis } (323{,}13°)}{3 \text{ cis } (90°)}$	✓ numerator polar form / *teller polêre vorm*	**A**
		✓denominator polar form/ *noemer polêre vorm*	**A**
	$= \frac{5}{3}\text{cis}(233{,}13°)$ **OR/*OF*** $= -1 - 1{,}33i$	✓ ✓ complex number/ *komplekse getal*	**A** (4)

1.4	$\frac{110100_2}{2}$ $= \frac{52}{2}$ **OR/*OF*** $= \frac{110100_2}{10_2}$ $= 26$ $\therefore 26 = 11010_2$ $= 11010_2$	✓ 52 **OR/*OF*** 10_2 ✓ 11010_2 **AO: Full marks/ *Volpunte*** **No penalty for base 2 omitted/ *Geen penalisering vir basis 2 weggelaat***	**A** **CA** (2)
			[22]

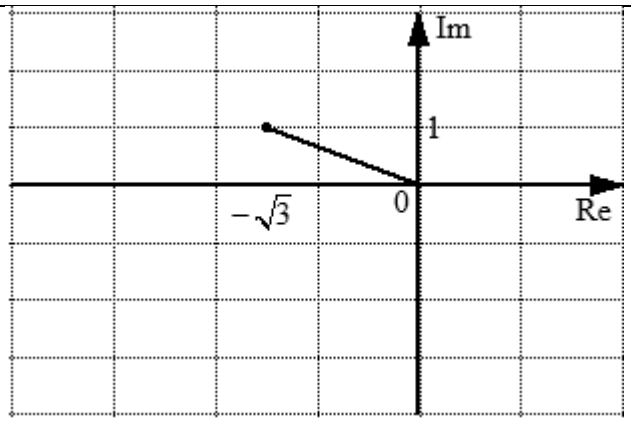
QUESTION/*VRAAG* 2

2.1.1	$k = 20$	✓ value of k	**A** (1)
2.1.2	$\Delta = 1 + 40k = 1 + 40(2)$ **OR/ *OF*** $x = \frac{1 \pm \sqrt{1 + 40(2)}}{20 - (2)}$ $\Delta = 81$ $\quad x = \frac{5}{9} \approx 0,56$ or/*of* $x = -\frac{4}{9} \approx -0,44$ Roots are real, rational and unequal/ *Wortels is reële, rasionaal en ongelyk*	✓subst. ✓ 81 **OR/*OF*** values of/ *waardes van* x ✓ real,rational and unequal/ *reële, rasionaal en ongelyk* **AO: Full Marks/ *Volpunte*** **No Penalty if real is omitted/** ***Geen Penalisering*** ***as reële weggelaat word***	**A** **CA** **CA** (3)
2.2	$3x^2 - 4x + q = 0$ $\Delta = b^2 - 4ac$ $= (-4)^2 - 4(3)(q)$ $= 16 - 12q$ For real roots/ Vir *reële wortels*: $\Delta \geq 0$ $16 - 12q \geq 0$ $\therefore q \leq \frac{4}{3}$ **OR/*OF*** $q \leq 1,33$	✓ **SF** ✓ **S** ✓ $\Delta \geq 0$ ✓ values of /*waardes van q*	**A** **CA** **A** **CA** (4)
			[8]

QUESTION/*VRAAG* 3

3.1.1	$\left(2y^3\right)^4$ $=16y^{12}$ **OR/** ***OF*** $=2^4y^{12}$	✓ $16y^{12}$ **OR/** ***OF*** 2^4y^{12} **A** (1)
3.1.2	$\left(3\sqrt{a}-\sqrt{b}\right)\left(3\sqrt{a}+\sqrt{b}\right)$ $=9a+3\sqrt{ab}-3\sqrt{ab}-b$ $=9a-b$ **OR/** ***OF*** $=9\times a-b$	✓ Expansion/ *Uitbreiding* **A CA** ✓ **S** **AO: Full Marks/** ***Volpunte*** (2)
3.1.3	$\frac{3^{4x+1}\cdot 81^{-x}}{3}$ $=\frac{3^{4x+1}\times 3^{-4x}}{3}$ $=3^{4x+1-4x-1}$ $=3^0=1$ **OR/*OF*** $\frac{3^{4x+1}\cdot 81^{-x}}{3}$ $=\frac{3^{4x}.3\times 3^{-4x}}{3}$ $=1$ **OR/*OF*** $\frac{3^{4x+1}\cdot 81^{-x}}{3}$ $=\frac{3^{4x}\cdot 3}{3\cdot 3^{4x}}$ **OR/*OF*** $\frac{81^x.3}{3.81^x}$ **OR/*OF*** $\frac{81^x\cdot 3\times\frac{1}{81^x}}{3}$ $=1$	✓ 3^{-4x} **A** ✓exp. prop/ *eksp. eienskap* **CA** ✓ **S** **CA** **OR/*OF*** ✓ $3^{4x}.3$ **A** ✓ 3^{-4x} **A** ✓ **S** **CA** **OR/*OF*** ✓ $3^{4x}\cdot 3$ **OR/*OF*** $81^x.3$ **A** ✓ 3^{4x} **OR/*OF*** 81^x **OR/*OF*** $\frac{1}{81^x}$ **A** ✓ **S** **CA** **AO: 1 Mark/** ***punt*** (3)

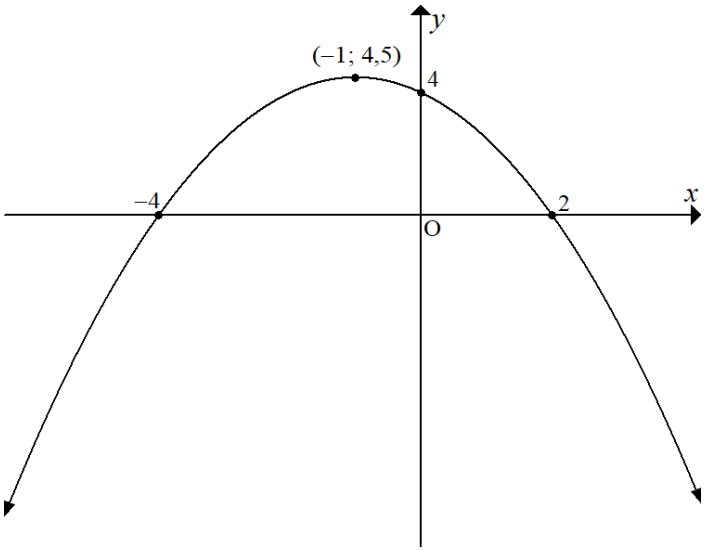
3.1.4	$\log 4 + \log 25 - \log_2 16$ $= \log\left(4 \times 25\right) - 4\log_2 2$ **OR/ *OF*** $= \log\left(2^2 \times 5^2\right) - \log_2 2^4$ $= \log 100 - 4(1)$ $= 2\log 10 - 4\log_2 2$ $= 2 - 4$ $= -2$	✓ log prop./*eienskap* **A** ✓ log prop./*eienskap* **A** ✓ **S** **CA** **AO: 1 mark/ *punt*** (3)
3.2	$\log x - \log 5 = -1$ $\log \frac{x}{5} = -1$ **OR/ *OF*** $\log \frac{x}{5} = -\log 10$ $\frac{x}{5} = 10^{-1}$ **OR/ *OF*** $\log \frac{x}{5} = \log 10^{-1}$ $\frac{x}{5} = \frac{1}{10}$ $\therefore x = \frac{1}{2}$ **OR/ *OF*** $\log x - \log 5 = -1$ $\log x - \log 5 + \log 10 = 0$ $\log \frac{10x}{5} = 0$ $\frac{10x}{5} = 10^0$ $10x = 5$ $\therefore x = \frac{1}{2}$	✓ log prop./*eienskap* **A** ✓ 10^{-1} **OR/ *OF*** $\log 10^{-1}$ **A** ✓ **S** **CA** **OR/ *OF*** ✓ log prop./*eienskap* **A** ✓ 10^0 **A** ✓ **S** **CA** **AO: 1 mark/ *punt*** (3)

3.3.1		✓ quadrant / *kwadrant* **A** ✓ co-ordinates / *koördinate* **A** **NOTE /LET WEL: If only the point is indicated award FULL marks/ *Indien slegs die punt aangedui word, ken VOLPUNTE toe*** (2)
3.3.2 #	$z = -\sqrt{3} + i$ $r = \sqrt{\left(-\sqrt{3}\right)^2 + (1)^2}$ $= 2$ *ref / verw.*$\angle = \tan^{-1}\left(\frac{1}{\sqrt{3}}\right)$ **OR/*OF*** $cos^{-1}\left(\frac{\sqrt{3}}{2}\right)$ **OR/*OF*** $sin^{-1}\left(\frac{1}{2}\right)$ $= 30°$ $\theta = 180° - 30° = 150°$ $\therefore\ z = 2(\cos 150° + i \sin 150°)$ **OR/*OF*** $2cis150°$ **OR/*OF*** $2 \angle 150°$	✓**SF** **A** ✓ modulus **CA** ✓ ref. angle/ *verw. hoek* **A** ✓ θ in correct quadrant/ θ *in korrekte kwadrant* **CA** ✓ polar form/ *polêre vorm* **CA** **AO: 1 mark/ *punt*** (5)
3.4	$m + ni = -3i + 12$ $\therefore m = 12$ and / *en* $n = -3$	✓ *m* value/*waarde* **A** ✓ *n* value/*waarde* **A** (2)
		[21]

QUESTION/*VRAAG* 4

4.1.1	$y-\text{intercept/}afsnit = 4$ **OR/** ***OF*** $(0;4)$	✓ $y = 4$ **Accept/*Aanvaar* : 4**	**A** (1)
4.1.2	$-\frac{1}{2}x^2 - x + 4 = 0$ $x^2 + 2x - 8 = 0$ $(x+4)(x-2) = 0$ **OR/** ***OF*** $x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4\left(-\frac{1}{2}\right)(4)}}{2\left(-\frac{1}{2}\right)}$ $x = -4$ or / *of* $x = 2$	✓ equate to /*gelykstelling aan* 0 ✓ factors / *faktore/* **SF** ✓ both values / *beide waardes van* x	**A** **A** **CA** (3)
4.1.3	$x \in \mathrm{R}$ **OR/** ***OF*** $x \in (-\infty; \infty)$ **OR/** ***OF*** All real values of x/ *Alle reële waardes van x*	✓ domain/ *definisieversameling*	**A** (1)
4.1.4	$f'(x) = -x - 1 = 0$ $\therefore\ x = -1$ $\therefore f(-1) = -\frac{1}{2}(-1)^2 - (-1) + 4$ $= 4\frac{1}{2}$ $\therefore \left(-1\ ;\ 4\frac{1}{2}\right)$ **OR/** ***OF*** $x = -\frac{b}{2a}$ $x = -\frac{-1}{2\left(-\frac{1}{2}\right)}$ $\therefore\ x = -1$ $\therefore f(-1) = -\frac{1}{2}(-1)^2 - (-1) + 4 = 4\frac{1}{2}$ $\therefore \left(-1\ ;\ 4\frac{1}{2}\right)$	✓ derivative equal to 0/ *afgeleide gelyk aan* 0 ✓ $x = -1$ ✓ y-value/*waarde* **OR/** ***OF*** ✓ **SF** ✓ $x = -1$ ✓ y-value/*waarde*	**A** **CA** **CA** **A** **CA** **CA**

	OR/ *OF*	**OR/ *OF***
	$x = \frac{x_1 + x_2}{2} = \frac{-4+2}{2} = -1$ $y = \frac{4ac - b^2}{4a} = \frac{4\left(-\frac{1}{2}\right)(4) - (-1)^2}{4\left(-\frac{1}{2}\right)} = 4\frac{1}{2}$ $\therefore \left(-1\ ;\ 4\frac{1}{2}\right)$	✓ **SF** **CA** ✓ $x = -1$ **CA** ✓ *y*-value/*waarde* **CA** **AO: Full Marks/ *Volpunte*** (3)

4.1.5		✓ shape / *vorm* **A** ✓ *x*- and/ *en y*-intercepts/ *afsnitte* **CA** **CA** ✓ turning point/ *draaipunt* (3)
4.1.6	New equation / *Nuwe vergelying* : $p(x) = -\frac{1}{2}x^2 - x + 7$	✓ new equation / *nuwe vergelyking* **A** (1)

4.2.1	C (0; 4)	✓ $x = 0$ ✓ $y = 4$	**A** **A** (2)
4.2.2	A (– 4; 0) & B (4; 0) ∴ AB = 8 units/ *eenhede*	✓ coordinates of A and B/ *koördinate van A en B* ✓ length of AB/ *lengte van AB* **AO: Full marks/ *Volpunte***	**CA** **CA** (2)
4.2.3	$0 \le y \le 4$ **OR/ *OF*** $y \in [0\,;4]$ **OR/ *OF*** $y \ge 0$ and/ *en* $y \le 4$ **OR/ *OF*** *y* values from 0 to 4/ *y waardes van* 0 tot 4	✓ critical values / *kritieke waardes* ✓ correct notation / *korrek notasie*	**CA** **A** (2)
4.2.4	Subst / *Vervang* C(0 ; 4): $4 = 2^0 + q$ $\therefore 4 = 1 + q$ $\therefore q = 3$	✓ substitute C / *vervang* C ✓ value of / *waarde van q* **AO: Full Marks/ *Volpunte***	**CA** **CA** (2)
4.2.5 #	$m_{BC} = \frac{4-0}{0-4} = -1$ $\therefore m_{\text{new line/ } nuwe\ lyn} = -1$ ∴ subs. / *vervang* A$(-4;0)$: $y - y_1 = m(x - x_1)$ **OR / *OF*** $y = mx + c$ $y - 0 = -1(x + 4)$ $0 = -1(-4) + c$ $-4 = c$ $\therefore y = -x - 4$	✓ gradient/ *gradiënt* ✓ gradient of parallel line/ *gradiënt van ewewydige lyn* ✓ sub point A./ *vervang punt* A ✓ value of c/ *waarde van c* **AO: Full Marks/ *Volpunte***	**CA** **CA** **CA** **CA** (4)
			[24]

QUESTION/*VRAAG* 5 (Zero marks if wrong Formula is used in this Question / *Nul punte indien verkeerde formule in hierdie vraag gebruik word*)

5.1.1	10 years / *jaar*	✓ 10	**A** (1)
5.1.2	$A = P(1+i)^n$ $= 107\ 200\ (1+7,5\%)^{10}$ $\approx 220\ 942$ **OR/** ***OF*** $\approx 220\ 943$ people / *mense*	✓ **F** ✓ **SF** ✓ **S** **R**	**A** **CA** **CA** (3)
5.2.1	R504 000	✓ 504 000	**A** (1)
5.2.2	$A = P(1-i)^n$ $504\ 000 = 2\ 520\ 000(1-0,21)^n$ $\frac{1}{5} = (0,79)^n$ $n = \log_{0,79}\frac{1}{5}$ **OR/** ***OF*** $n = \frac{\log\frac{1}{5}}{\log 079}$ $n = 6,827...$ $n \approx 7$ years / *jaar*	✓ **F** ✓ **SF** ✓ **S** ✓ log form / *vorm* ✓ 6,83 **Accept 7 yrs./*Aanvaar* 7yr.** **NPR**	**A** **CA** **CA** **CA** **CA** (5)

5.3 #	**Amount at the end of 1 year / Bedrag *aan die einde v 1 jaar:*** $A = R\ 60\ 000\left(1+\frac{11\%}{4}\right)^{1\times 4} + R15\ 000$ $\approx R81\ 877,27...$	✓ **SF** **A** ✓ 81 877,27... **CA**
	Amount at the end of 4 years / Bedrag *aan die einde v 4 jaar* $A = [81\ 877,27...]\times\left(1+\frac{13,7\%}{2}\right)^{3\times 2} + R\ 20\ 000$ $A \approx R\ 141\ 845,794...$	✓ rate **A** ✓ 141 845,794... **CA**
	Amount at the end of 7 years / Bedrag *aan die einde v 7 jaar* $A = 141\ 845,794...\times\left(1+\frac{13,7\%}{2}\right)^{3\times 2}$ $A \approx R\ 211\ 088,04$	✓ R 211 088,04 **CA**
	Phumza will reach her goal of saving **ENOUGH** money for her children's studies / *Phumza sal haar doel bereik om **GENOEG** geld te spaar vir haar kinders se studies*	✓ conclusion/ *gevolgtrekking* **CA**
	OR/ *OF*	**OR/ *OF***
	$\left\{\left[60\ 000\left(1+\frac{0,11}{4}\right)^{4}+15000\right]\left(1+\frac{0,137}{2}\right)^{6}+20000\right\}$ $\times\left(1+\frac{0,137}{2}\right)^{6}$ $A \approx R\ 211\ 088,04$	✓ $60000\left(1+\frac{0,11}{4}\right)^{4}$ **A** ✓ **M** **A** ✓ $\left(1+\frac{0,137}{2}\right)^{6}$ **A** ✓ **M** **A** ✓ $A \approx R\ 211\ 088,04$ **CA**
	Phumza will reach her goal of saving **ENOUGH** money for her children's studies / *Phumza sal haar doel bereik om **GENOEG** geld te spaar vir haar kinders se studies*	✓ conclusion/ *gevolgtrekking* **CA**
	OR/ *OF*	**OR/ *OF***

	$A = R\ 60\ 000\left(1+\frac{11\%}{4}\right)^{1\times 4}\times\left(1+\frac{13{,}7\%}{2}\right)^{6\times 2}+$ $R15\ 000\left(1+\frac{13{,}7\%}{2}\right)^{6\times 2}+R\ 20\ 000\left(1+\frac{13{,}7\%}{2}\right)^{3\times 2}$	✓ ✓ $\times\left(1+\frac{13{,}7\%}{2}\right)^{6\times 2}$ ✓ $R15\ 000\left(1+\frac{13{,}7\%}{2}\right)^{6\times 2}$ ✓ $R\ 20\ 000\left(1+\frac{13{,}7\%}{2}\right)^{3\times 2}$	**A** **A** **A** **A**
	$A \approx R\ 211\ 088{,}04$ Phumza will reach her goal of saving **ENOUGH** money for her children's studies / *Phumza sal haar doel bereik om **GENOEG** geld te spaar vir haar kinders se studies*	✓ $A \approx R\ 211\ 088{,}04$ ✓ conclusion/ *gevolgtrekking* **NPR**	**CA** **CA** (6)
			[16]

QUESTION/*VRAAG* 6

Notation will only be penalised in Q 6.1/ *Notasie sal slegs in V 6.1 gepenaliseer word*

6.1	$f(x) = -5$ $f'(x) = \lim_{h\to 0} \frac{f(x+h)-f(x)}{h}$ $= \lim_{h\to 0} \frac{-5-(-5)}{h}$ $= \lim_{h\to 0} \frac{0}{h}$ $\therefore f'(x) = 0$	✓ definition/*definisie* ✓ **SF** ✓ **S** ✓ 0 **AO: 0 marks**	**A** **A** **CA** **CA** (4)
6.2.1	$y = -3x^{-2} + 4x^{\frac{1}{2}}$ $\frac{dy}{dx} = 6x^{-3} + 2x^{-\frac{1}{2}}$ **OR/ *OF*** $\frac{dy}{dx} = \frac{6}{x^3} + \frac{2}{\sqrt{x}}$	✓ $6x^{-3}$ ✓ $2x^{-\frac{1}{2}}$	**A** **A** (2)
6.2.2 #	$D_x\left[\left(\frac{3}{x}+5\right)(2x-1)\right]$ **OR/ *OF*** $D_x\left[\left(3x^{-1}+5\right)(2x-1)\right]$ $= D_x\left(6-\frac{3}{x}+10x-5\right)$ $D_x\left[6-3x^{-1}+10x-5\right]$ $= D_x\left(1-3x^{-1}+10x\right)$ $= 3x^{-2} + 10$ **OR/ *OF*** $= \frac{3}{x^2} + 10$	✓ $-3x^{-1}$ ✓ $10x$ ✓ 1 ✓ $3x^{-2}$ **OR/ *OF*** $\frac{3}{x^2}$ ✓ 10 ✓ 0 **(Implied/ *Geïmpliseer*)**	**A** **A** **A** **CA** **CA** **CA** (6)
6.3.1	$-8x^{\frac{3}{2}}$ **OR/ *OF*** $-8x^{1,5}$	✓ $-8x^{\frac{3}{2}}$	**A** (1)
6.3.2	$\frac{d}{dx}\left(-8x^{\frac{3}{2}}\right)$ $= -12x^{\frac{1}{2}}$ **OR/ *OF*** $-12x^{0,5}$ **OR/ *OF*** $-12\sqrt{x}$	✓ $-12x^{\frac{1}{2}}$	**CA** (1)

6.4.1	$g(-1) = -2(-1)^2 + 3(-1)$ $\therefore\ g(-1) = -5$	✓ $g(-1) = -5$	**A** (1)
6.4.2	$g(x) = -2x^2 + 3x$ $g'(x) = -4x + 3$ $g'(x) = -4x + 3$ $\therefore\ g'(-1) = -4(-1) + 3$ $= 7$ $y = mx + c$ **OR/*OF*** $y - y_1 = m(x - x_1)$ $-5 = 7(-1) + c$ $y - (-5) = 7(x + 1)$ $c = 2$ $y + 5 = 7x + 7$ $\therefore y = 7x + 2$	✓ derivative of /*afgeleide van* ✓ subst. / *vervang* ✓ gradient/ *gradiënt* ✓ **SF** ✓ eqn. of tangent / *vergelyking v raaklyn*	**A** **CA** **CA** **CA** **CA** (5)
			[20]

QUESTION/*VRAAG* 7

7.1	$f(x)=(x+3)(x-1)(x-3)$ $=(x^2-9)(x-1)$ **OR/*OF*** $(x+3)(x^2-4x+3)$ **OR/ *OF*** $(x-3)(x^2+2x-3)$ $=x^3-x^2-9x+9$	✓ expansion / *uitbreiding* ✓ standard form / *standaardvorm*	**A** **CA** (2)
7.2	$\mathrm{G}(0\ ;\ 9)$	✓ *x*–coordinate / *koördinaat* ✓ *y*–coordinate / *koördinaat*	**A** **CA** (2)
7.3	Average gradient/*gemiddelde gradiënt* $=\frac{9-0}{0+3}$ $=3$	✓ **SF** ✓ average gradient/ *gemiddelde gradiënt*	**CA** **CA** (2)
7.4	$f'(x)=3x^2-2x-9$ $0=3x^2-2x-9$ $x=\frac{-(-2)\pm\sqrt{(-2)^2-4(3)(-9)}}{2(3)}$ $=\frac{2\pm\sqrt{112}}{6}$ $\approx -1,43$ or / *of* $2,10$ $f(-1,43)=(-1,43)^3-(-1,43)^2-9(-1,43)+9$ $\approx 16,9$ $f(2,10)=(2,10)^3-(2,10)^2-9(2,10)+9$ $\approx -5,05$ $\therefore \mathrm{M}(-1,43;16,9)$ *and / en* $\mathrm{N}(2,10;-5,05)$ **OR/ *OF***	✓ derivative/*afgeleide* ✓ equating derivative to 0/ *stel afgeleide gelyk aan 0* ✓ **SF** ✓ both values of /*beide waardes van x* ✓ both values of / *beide waardes van y* **OR/ *OF***	**CA** **A** **CA** **CA** **CA**

	$f'(x) = 3ax^2 + 2bx + c = 0$ $x = \frac{-(2b) \pm \sqrt{(2b)^2 - 4(3a)(c)}}{2(3a)}$ $x = \frac{-(2(-1)) \pm \sqrt{(2(-1))^2 - 4(3(1))(-9)}}{2(3(1))}$ $\approx -1,43$ or / *of* $2,10$ $f(-1,43) = (-1,43)^3 - (-1,43)^2 - 9(-1,43) + 9$ $\approx 16,9$ $f(2,10) = (2,10)^3 - (2,10)^2 - 9(2,10) + 9$ $\approx -5,05$ $\therefore \text{M}(-1,43;16,9)$ *and / en* $\text{N}(2,10;-5,05)$	✓ derivative/*afgeleide* **A** ✓ equating derivative to 0/ *stel afgeleide gelyk aan 0* **A** ✓ **SF** **CA** ✓ both values of /*beide waardes van x* **CA** ✓ both values of / *beide waardes van y* **CA** (5)
7.5	$x < -3$ or / *of* $1 < x < 3$ **OR / *OF*** $x \in (-\infty;-3) \cup (1;3)$ **OR / *OF*** **Accept / *Aanvaar:*** x values less than -3 or x values between 1 and 3 / *x-waardes kleiner as* -3 *of* x-waardes *tussen 1 en 3*	✓ $x < -3$: **A** **For / *vir:*** $1 < x < 3$: **:** ✓ critical values / *kritieke waardes* **A** ✓ correct notation / *korrek notasie* **A** **OR / *OF*** ✓ $x < -3$: **A** **For / *vir:*** $1 < x < 3$: **:** ✓ critical values / *kritieke waardes* **A** ✓ correct notation / *korrek notasie* **A** (3)
			[14]

QUESTION/*VRAAG* 8

8.1	291 KPa	✓ 291 KPa	**A** (1)
8.2	For maximum/ *Vir maksimum* $P'(t) = 0$ $P'(t) = -\frac{1}{2}t + 3 = 0$ **OR / *OF*** $t = -\frac{b}{2a} = -\frac{(3)}{2\left(-\frac{1}{4}\right)}$ $\therefore t = 6$ $P(6) = -\frac{1}{4}(6)^2 + 3(6) + 291$ $= 300$ KPa **OR/*OF*** $Max = \frac{4ac - b^2}{4a}$ $= \frac{4\left(-\frac{1}{4}\right)(291) - (3)^2}{4\left(-\frac{1}{4}\right)}$ $= 300$ KPa	✓ derivative/ *afgeleide* **OR/*OF* F** ✓ equating derivative to 0/ *stel afgeleide gelyk aan 0* **OR/*OF* SF** ✓ $t = 6$ **CA** ✓ 300 KPa **CA** **OR/*OF*** ✓ **F** **A** ✓ **SF** **A** ✓ ✓ 300 Kpa **CA** **AO: Full Marks/ *Volpunte*** (4)	**A** **A**
8.3	$-\frac{1}{4}t^2 + 3t + 291 = 100$ $-\frac{1}{4}t^2 + 3t + 191 = 0$ $t = \frac{-(3) \pm \sqrt{(3)^2 - 4\left(-\frac{1}{4}\right)(191)}}{2\left(-\frac{1}{4}\right)}$ $t = -22{,}28$ or/*of* 34,28 $\therefore t = 34{,}28$ s	✓ std. form/ *vorm* **A** ✓**SF** **CA** ✓ both values/ *beide waardes* **CA** ✓ conclusion/ *gevolgtrekking* **CA** **AO: Full Marks/ *Volpunte*** **NPU** (4)	
			[9]

QUESTION/*VRAAG* 9

9.1.1	$\int \left(4x^4 + x^{-2} + 5\right) dx$ $= \frac{4}{5}x^5 - \frac{1}{x} + 5x + C$ **OR/*OF*** $\frac{4}{5}x^5 - x^{-1} + 5x + C$	✓ $\frac{4}{5}x^5$ **A** ✓ $-\frac{1}{x}$ **OR/*OF*** $-x^{-1}$ **A** ✓ $5x$ **A** ✓ C **A** (4)
9.1.2	$\int \left(\frac{3}{5^{2x}}\right) dx$ $= \int \left(3 \cdot 5^{-2x}\right) dx$ $= \frac{3 \cdot 5^{-2x}}{-2\ln 5} + C$ **OR/*OF*** $= \frac{3}{-2.5^{2x}\ln 5} + C$ **OR/*OF*** $\int \left(\frac{3}{5^{2x}}\right) dx$ $= \int 3\left(\frac{1}{5}\right)^{2x} dx$ $= 3 \cdot \frac{\left(\frac{1}{5}\right)^{2x}}{2\ln\left(\frac{1}{5}\right)} + C$	✓ $3 \cdot 5^{-2x}$ **A** ✓ $3 \cdot \frac{5^{-2x}}{-2\ln 5} + C$ **OR/*OF*** $\frac{3}{-2.5^{2x}\ln 5} + C$ **CA** **OR/*OF*** ✓ $3\left(\frac{1}{5}\right)^{2x}$ **A** ✓ $3 \cdot \frac{\left(\frac{1}{5}\right)^{2x}}{2\ln\left(\frac{1}{5}\right)} + C$ **CA** **No Penalty if C is omitted/** ***Geen Penalisering*** ***as C weggelaat is*** (2)
9.1.3	$\int \left(\frac{x^2 - 10x}{x}\right) dx$ $= \int (x - 10) dx$ $= \frac{x^2}{2} - 10x + C$	✓ **S** **A** ✓ $\frac{x^2}{2}$ **CA** ✓ $-10x + C$ **CA** **No Penalty if C is omitted** ***Geen Penalisering*** ***as C weggelaat is*** (3)

9.2	$4 = x + 3$ **OR/*OF*** $4 = \frac{5}{x} - 1$ $\therefore x_A = 1$ $0 = \frac{5}{x} - 1$ $\therefore x_C = 5$ $A = \int_1^5 \left(\frac{5}{x} - 1\right) dx$ $= \left[5\ln x - x\right]_1^5$ $= \left[5\ln 5 - 5\right] - \left[5\ln 1 - 1\right]$ $\approx 4,05$ units^2 / *eenhede*^{2}	✓ **M** ✓ $x_A = 1$ ✓ $x_C = 5$ ✓ area notation/ *area notasie* ✓integrals/*integreer* ✓ **SF** ✓ $A = 4,05$	**A** **CA** **A** **A** **CA** **CA** **CA** (7)
			[16]

TOTAL/*TOTAAL*: 150

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