basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NATIONAL SENIOR CERTIFICATE *NASIONALE SENIOR SERTIFIKAAT*

GRADE 12/*GRAAD* 12

TECHNICAL MATHEMATICS P1/*TEGNIESE WISKUNDE V1*

NOVEMBER 2024

MARKING GUIDELINES/*NASIENRIGLYNE*

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*

These marking guidelines consist of 19 pages.
Hierdie nasienriglyne bestaan uit 19 bladsye.

NOTE:
- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent accuracy (CA) applies in all aspects of the marking guidelines where indicated.
- No penalty for rounding (NPR) for ALL questions.
- # Shows questions where a Tolerance Range will be applied: **Q 2.2 ; Q 4.1.5 ; Q 5.4 & Q 9.2.2**

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 soos aangedui.*
- *Geen penalisering vir afronding (NPR) vir ALLE vrae nie.*
- *# Toon vrae waar Toleransie wydte (Verdraagsaamheids-omvang) toegepas word:* ***V 2.2 ; V 4.1.5 ; V 5.4 & V 9.2.2***

QUESTION/*VRAAG* 1

1.1.1	$x(2x+7)=0$ $x=0$ or/*of* $-\frac{7}{2}$ **OR/*OF*** $x=-3,5$	✓0 **A** ✓$-\frac{7}{2}$ **OR/*OF*** $-3,5$ **A** (2)
1.1.2	$3x^2+x=6+5x$ $3x^2-4x-6=0$ **OR/*OF*** $0=-3x^2+4x+6$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\frac{-(-4)\pm\sqrt{(-4)^2-4(3)(-6)}}{2(3)}$ **OR/*OF*** $=\frac{-(4)\pm\sqrt{(4)^2-4(-3)(6)}}{2(-3)}$ $=\frac{4\pm\sqrt{88}}{6}$ $\therefore x\approx 2,23$ or/*of* $x\approx -0,90$ **Refer to the Addendum/** ***Verwys na die Addendum***	✓std form/*vorm* **A** ✓**SF** **CA** ✓ $x\approx 2,23$ **CA** ✓ $x\approx -0,90$ **CA** **NPR** (4)

1.1.3	$x^2 + 3x - 10 \leq 0$ $(x - 2)(x + 5) \leq 0$ **OR/*OF*** $\frac{-(3) \pm \sqrt{(3)^2 - 4(1)(-10)}}{2(1)}$	✓factors/f*aktore*/**SF** **A**
	Critical values/*Kritieke waardes*: 2 and/*en* -5	✓both critical values/ *kritieke waardes* **CA**
	$\therefore -5 \leq x \leq 2$ **OR/*OF*** $x \in [-5; 2]$ **OR/*OF*** $x \geq -5$ and/*en* $x \leq 2$ **OR/*OF***  **OR/*OF***	✓correct notation/ *korrekte notasie*/ correct graphical solution/*korrekte grafiese oplossing* **A**
	Accept**:** From -5 to 2 / *Aanvaar*: *Vanaf* -5 *tot* 2	**AO: Full Marks/ *Volpunte*** (3)

1.2	$y-x=2$ and/en $x^2+y^2=20$	
	$x=y-2$	✓subject/*onderwerp* **A**
	$(y-2)^2+y^2=20$	✓subst./*vervang* **CA**
	$y^2-4y+4+y^2=20$	
	$2y^2-4y-16=0$	✓std form/*vorm* **CA**
	$2(y-4)(y+2)=0$ **OR/*OF*** $y=\frac{-(-4)\pm\sqrt{(-4)^2-4(2)(-16)}}{2(2)}$	✓Factors/*Faktore*/**SF** **CA**
	$\therefore\ y=4$ or/*of* $y=-2$	✓both *y*-values/*beide y-wrdes* **CA**
	$\therefore\ x=4-2=2$ or/*of* $x=-2-2=-4$	✓both *x*-values/*beide x-wrdes* **CA**
	OR/*OF*	**OR/*OF***
	$y=x+2$	✓subject/*onderwerp* **A**
	$x^2+(x+2)^2=20$	✓subst./*vervang* **CA**
	$x^2+x^2+4x+4=20$	
	$2x^2+4x-16=0$	✓std form/*vorm* **CA**
	$2(x-2)(x+4)=0$ **OR/*OF*** $x=\frac{-(4)\pm\sqrt{(4)^2-4(2)(-16)}}{2(2)}$	✓ Factors/*Faktore*/**SF** **CA**
	$\therefore\ x=2$ or/*of* $x=-4$	✓both *x*-values/*beide x-wrdes* **CA**
	$\therefore\ y=2+2=4$ or/*of* $y=-4+2=-2$	✓both *y*-values/*beide y-wrdes* **CA**
	Refer to the Addendum/ *Verwys na die Addendum*	(6)

1.3.1	$CR = \frac{CV + SV}{SV}$ $SV \times CR = CV + SV$ $CV = SV \times CR - SV$ **OR/*OF*** $CV = SV \times (CR - 1)$ **OR/*OF*** $CR = \frac{CV}{SV} + \frac{SV}{SV}$ $CR = \frac{CV}{SV} + 1$ $CV = SV \times (CR - 1)$	✓multiplying by *SV/ vermenigvuldiging met SV* **A** ✓*CV* subject/*onderwerp* **CA** **OR/*OF*** ✓dividing/ *verdeling* **A** ✓*CV* subject/ *onderwerp* **CA** (2)
1.3.2	$CV = SV \times CR - SV$ $= 48\ \text{cm}^3 \times \frac{9,5}{1} - 48\ \text{cm}^3$ $= 408\ \text{cm}^3$ **OR/*OF*** $CV = SV\ (CR - 1)$ $= 48\ \text{cm}^3 \left(\frac{9,5}{1} - 1 \right)$ $= 408\ \text{cm}^3$ **OR/*OF*** $CR = \frac{CV + SV}{SV}$ $\frac{9,5}{1} = \frac{CV + 48\,\text{cm}^3}{48\,\text{cm}^3}$ $\therefore CV = 408\ \text{cm}^3$	✓**SF** **CA** ✓**S** **CA** **OR/*OF*** ✓**SF** **CA** ✓**S** **CA** **OR/*OF*** ✓**SF** **A** ✓**S** **CA** **NPU** (2)

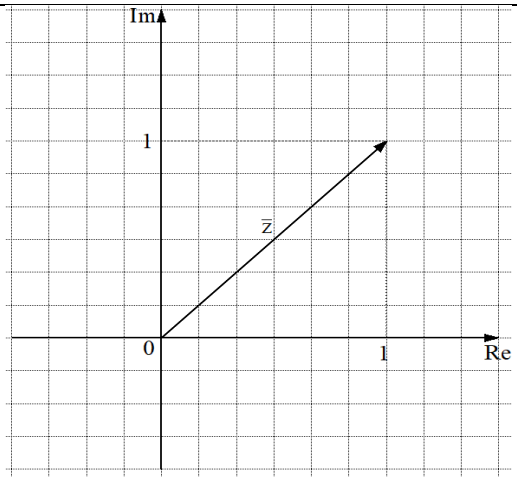
1.4	$1110_{2} = 14$	✓14 **A** (1)
1.5	$1110_{2} \times 35$ $= 14 \times 35 = 490 = 111101010_2$ **OR/*OF*** $1110_2 \times 100011_2 = 111101010_2$ **Refer to the Addendum /*Verwys na die Addendum***	✓490 **CA** ✓ 111101010_{2} **CA** **OR/*OF*** ✓ 100011_{2} **A** ✓ 111101010_{2} **CA** **AO: Full marks/*Volpunte*** (2)
		[22]

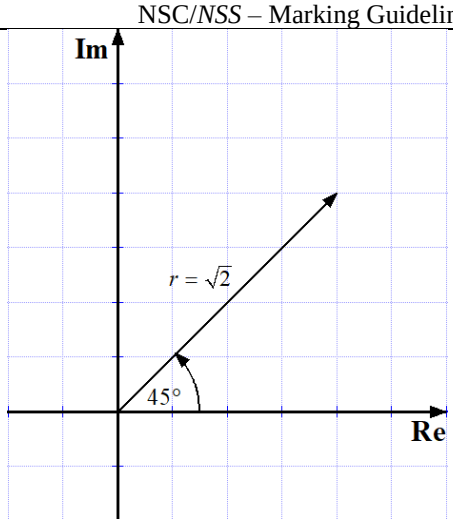
QUESTION/*VRAAG* 2

2.1.1	$p = 3$	✓ 3 **A** (1)
2.1.2	$1 - 7p < 0$ $p > \frac{1}{7}$ **OR/*OF*** $p > 0{,}14$	✓ $\Delta < 0$ **A** ✓ $p > \frac{1}{7}$ **OR/*OF*** $p > 0{,}14$ **CA** **AO: Full marks/*Volpunte*** (2)
2.2	$3(x+1) = x^2 + t$ $x^2 - 3x - 3 + t = 0$ **OR /OF** $-x^2 + 3x + 3 - t = 0$ $(-3)^2 - 4(1)(-3+t) \geq 0$ **OR /OF** $(3)^2 - 4(-1)(3-t) \geq 0$ $9 + 12 - 4t \geq 0$ $-4t \geq -21$ $\therefore\ t \leq \frac{21}{4}$ **OR/*OF*** 5,25	✓standard form / *standaardvorm* **A** ✓**SF** **CA** ✓ $\Delta \geq 0$ **A** ✓value(s) of/ *waardes van* t **CA** (4)
		[7]

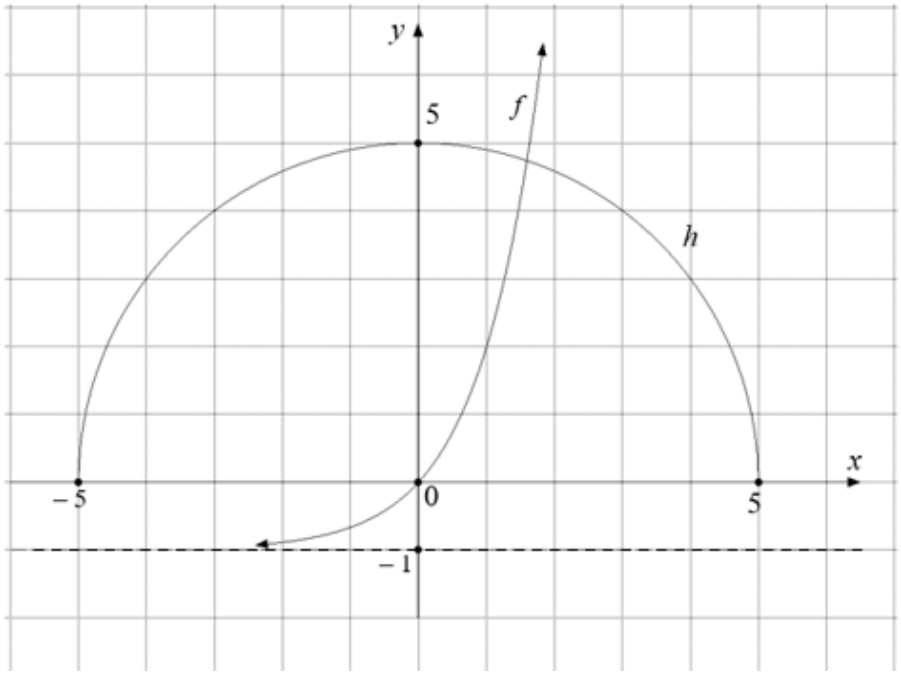
QUESTION/*VRAAG* 3

3.1.1	$27^{\frac{2}{3}} = 9$ **OR/*OF*** 3^2	✓ 9 **OR/*OF*** 3^2 **A** (1)
3.1.2	$\left(1+\sqrt{3}\right)^2 - \sqrt{12}$ $= 1+ 2\sqrt{3} + 3 - 2\sqrt{3}$ $= 4$ **Refer to the Addendum/ *Verwys na die Addendum***	✓expanding/ *uitbreiding* **A** ✓ $2\sqrt{3}$ **A** ✓**S** **CA** **AO : 1 mark/ *punt*** (3)
3.1.3	$\log_p p = 1$	✓ 1 **A** (1)
3.1.4	$\log_3 81 - \log_2 \sin 30° - \log_5 \sqrt{5}$ $= \log_3 3^4 - \log_2 \frac{1}{2} - \log_5 5^{\frac{1}{2}}$ **OR/*OF*** $= \frac{\log 3^4}{\log 3} - \frac{\log 2^{-1}}{\log 2} - \frac{\log 5^{\frac{1}{2}}}{\log 5}$ $= 4 + 1 - \frac{1}{2}$ $= 4\frac{1}{2}$ **OR/*OF*** $\frac{9}{2}$ **OR/*OF*** 4,5	✓ 4 **A** ✓ + 1 **A** ✓ $-\frac{1}{2}$ **A** ✓**S** **CA** **AO : 1 mark/ *punt*** (4)

3.2	$5^{x+2} - 5^x = \frac{24}{5}$ $5^x \times 5^2 - 5^x = \frac{24}{5}$ **OR/*OF*** $5^x \times 25 - 5^x = \frac{24}{5}$ $5^x\left(5^2 - 1\right) = \frac{24}{5}$ **OR/*OF*** $5^x\left(24\right) = \frac{24}{5}$ $5^x = \frac{1}{5} = 5^{-1}$ $\therefore x = -1$ **OR/*OF*** $5^{x+2} - 5^x = \frac{24}{5}$ $5^{x+3} - 5^{x+1} = 24$ $5^x \times 5^3 - 5^x \times 5^1 = 24$ **OR/*OF*** $5^x \times 125 - 5^x \times 5 = 24$ $5^x\left(5^3 - 5\right) = 24$ **OR/*OF*** $5^x\left(120\right) = 24$ $5^x = \frac{1}{5} = 5^{-1}$ $\therefore x = -1$	✓exp.prop./*eksp.einsk.* **A** ✓**S** **CA** ✓value of/*waarde van x* **CA** **OR/*OF*** ✓exp.prop./*eksp.einsk.* **A** ✓**S** **CA** ✓value of/*waarde van x* **CA** **AO: Full marks/*Volpunte*** (3)
3.3.1	$z_1 = 1 - i$	✓form/*vorm* **A** (1)
3.3.2	$\bar{z}_1 = 1 + i$	✓conjugate/*konjugeerde* **CA** (1)
3.3.3	 **OR/*OF***	✓ Real part/*Reële deel* **CA** ✓ Imaginary part/ *Imaginêre deel* **CA** ✓ terminal arm or point where Re and Im intersect/*terminale arm of punt waar Re en Im sny* **CA** **OR/*OF***

		✓ Modulus/ *Modulus* **CA** ✓✓ Argument/ *Argument* **CA** (3)
3.3.4	$r = \sqrt{1^2 + (-1)^2}$ $= \sqrt{2}$ **OR/*OF*** $\approx 1{,}41$ ref./verwys $\angle = \tan^{-1}\left(\frac{1}{1}\right)$ ref./verwys $\angle = 45°$ $\therefore\ \theta = 360° - 45° = 315°$ $\therefore z_1 = \sqrt{2}\,cis\ 315°$ **OR/*OF*** $z_1 \approx 1{,}41\,cis\ 315°$ **OR/*OF*** $r = \sqrt{1^2 + (-1)^2}$ $= \sqrt{2}$ **OR/*OF*** $\approx 1{,}41$ $\theta = \tan^{-1}\left(-\frac{1}{1}\right)$ $\theta = -45°$ $\therefore z_1 = \sqrt{2}\,cis\,(-45°)$ **OR/*OF*** $\therefore z_1 = 1{,}41\,cis\,(-45°)$	✓**SF** **CA** ✓*r* **CA** ✓ref./*verwys* $\angle$ **CA** ✓correct quadrant /*korrekte kwadrant* **CA** ✓polar form / *polêre vorm* **CA** **OR/*OF*** ✓**SF** **CA** ✓*r* **CA** ✓✓ $-45°$ **CA** ✓correct polar form /*korrekte polêre vorm* **CA** **AO: Full marks/*Volpunte*** (5)
		[22]

QUESTION 4/*VRAAG 4*

4.1.1	$y = -1$	✓ equation / *vergelyking* **A** (1)
4.1.2	$-5 \leq x \leq 5$ **OR/*OF*** $x \in [-5;5]$ **OR/*OF*** $x \leq 5$ and / *en* $x \geq -5$ **OR/*OF*** Accept**:** From -5 to 5 / *Aanvaar*: *Vanaf* -5 *tot* 5	✓ critical values / *kritieke waardes* **A** ✓ notation / *notasie* **A** (2)
4.1.3	$0 = 3^x - 1$ $3^x = 1$ $3^x = 3^0$ $x = 0$ Accept/*Aanvaar*: $(0;0)$	✓subst / *vervang*. $y = 0$ **A** ✓ $x = 0$ **A** **AO: Full marks/*Volpunte*** (2)
4.1.4	$y = 3^0 - 1$ $y = 0$ Accept/*Aanvaar*: $(0;0)$	✓ subst. / *vervang* $x = 0$ **A** ✓ $y = 0$ **CA** **AO: Full marks/*Volpunte*** (2)
4.1.5		

For/*vir* h:	For/ *vir* f:
✓ shape / *vorm* **A**	✓ shape / *vorm* **A**
✓ all intercepts on axes /*alle afsnitte op die asse* **A**	✓ asymptote / *asimptoot* **CA**
	✓ intercept(s) / *afsnitte* **CA**

(5)

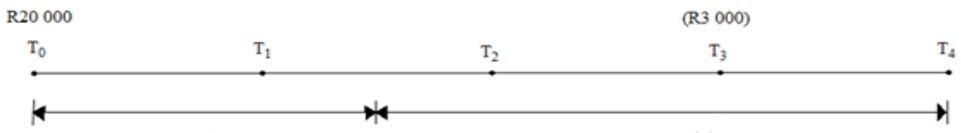
4.1.6	$-5 \le x \le 0$ or/*of* $x = 5$ **OR/*OF*** $x \in [-5\ ;\ 0]$ or/*of* $x = 5$ **OR/*OF*** $x \ge -5$ and/*en* $x \le 0$ or/*of* $x = 5$ Accept**:** From -5 to 0 or $x = 5$ /*Aanvaar*: *Vanaf* -5 *tot* 0 *of* $x = 5$	✓ $-5 \le x \le 0$ **CA** ✓ $x = 5$ **A** (2)
4.2	$g(x) = a(x - p)^2 + q$ $g(x) = a(x - 1)^2 - 4$ $4 = a(3 - 1)^2 - 4$ $8 = 4a$ $a = 2$ $g(x) = 2(x - 1)^2 - 4 = 2x^2 - 4x - 2$ **Refer to the Addendum/ *Verwys na die Addendum***	✓ subst./ *vervang* $(1\ ;-4)$ **A** ✓ subst./*vervang* $(3\ ;4)$ **A** ✓ value of / *waarde van* a **CA** ✓ equation in reqd form/ *vergelyking in voorgesk. vorm* **CA** (4)
4.3.1	$x = 0$ $y = 2$	✓ vertical- asymptote / *vertikale-asimptoot* **A** ✓ horizontal- asymptote / *horisontale-asimptoot* **A** **AO: Full marks/*Volpunte*** (2)
4.3.2	$p(x) = x + 2$ $4 = k + 2$ $k = 2$	✓ Subst./*vervang* **A** ✓ k value /*waarde* **CA** **AO: Full marks/*Volpunte*** (2)
4.3.3	$x = 2$ Accept/*Aanvaar*: $(2;0)$	✓ x value / *waarde* **CA** (1)
4.3.4	$h(x) = \frac{a}{x} + q = \frac{a}{x} + 2$ $0 = \frac{a}{2} + 2$ $a = -4$ $\therefore h(x) = -\frac{4}{x} + 2$	✓ Subst./*vervang* $(2;0)$ **CA** ✓ a value/ *waarde* **CA** (2)
		[25]

QUESTION/*VRAAG* 5

Note: ZERO MARKS if Incorrect Formula is used
Let wel: GEEN PUNTE indien Verkeerde Formule gebruik word.

5.1	$i_{eff} = \left(1+\frac{i}{m}\right)^m - 1$ $1 + 9{,}1\% = \left(1+\frac{i}{4}\right)^4$ $1+\frac{i}{4} = \sqrt[4]{1{,}091}$ $i = 4\left(\sqrt[4]{1{,}091} - 1\right)$ $\approx 8{,}80\,\%$ **OR/*OF*** $\approx 0{,}088$	✓**F** **A** ✓**SF** **A** ✓ **S** **CA** ✓ $8{,}80\,\%$ **OR/*OF*** $0{,}088$ **CA** (4)
5.2	$A = P(1+i)^n$ $= 50\,000(1+0{,}03)^5$ $\approx 57\,963{,}70$ **OR/*OF*** $A_1 = 50\,000(1{,}03) = 51\,500$ $A_2 = 51\,500(1{,}03) = 53\,045$ $A_3 = 53\,045(1{,}03) = 54\,636{,}35$ $A_4 = 54\,636{,}35(1{,}03) = 56\,275{,}4405$ $A_5 = 56\,275{,}4405(1{,}03) \approx 57\,963{,}70$ Accept/*Aanvaar*: $\approx 57\,963$ **OR/*OF*** $\approx 57\,964$	✓**F** **A** ✓**SF** **A** ✓**S** **CA** **OR/*OF*** ✓**SF** ✓51 500 **A** ✓**S** **A** (3)
5.3.1	$A = 260\,000 \times 0{,}25 = R65\,000$	✓ value / *waarde* **A** (1)
5.3.2	$A = P(1-i)^n$ $65\,000 = 260\,000(1-0{,}14)^n$ $(0{,}86)^n = 0{,}25$ **OR/*OF*** $\left(\frac{65\,000}{260\,000}\right) = (1-0{,}14)^n$ $n \log 0{,}86 = \log 0{,}25$ $n = \frac{\log 0{,}25}{\log 0{,}86}$ **OR/*OF*** $n = \log_{(1-0{,}14)}\left(\frac{65\,000}{260\,000}\right)$ $n \approx 9{,}19$ years / *jaar* Accept/*Aanvaar:* $n \approx 9$ years / *jaar* **OR/*OF*** $n \approx 10$ years / *jaar* **Refer to the Addendum/ *Verwys na die Addendum***	✓ **F** **A** ✓ **SF** **CA** ✓ log form / *vorm* **CA** ✓ value of / *waarde van n* **CA** (4)

5.4



$i = \frac{10\%}{12}$ $i = \frac{8\%}{4}$

$A = 20\,000\left(1 + \frac{10\%}{12}\right)^{1,5\times12} \approx R\,23\,222,25$	✓ $20\,000\left(1 + \frac{10\%}{12}\right)^{1,5\times12}$ **A**
$\approx 23\,222,25\left(1 + \frac{8\%}{4}\right)^{1,5\times4} \approx R\,26\,152,03$	✓ $23\,222,25\left(1 + \frac{8\%}{4}\right)^{1,5\times4}$ **CA**
$\therefore\ 26\,152,03 - 3000$ $\approx R\ 23\,152,03$	✓**M** **A**
$\approx 23\,152,03\left(1 + \frac{8\%}{4}\right)^{1\times4}$ $\approx R\,25\,060,49$	✓ $23\,152,03\left(1 + \frac{8\%}{4}\right)^{1\times4}$ **CA** ✓$\approx$ R 25 060,49 **CA**
OR/*OF*	**OR/*OF***
$A = 20\,000\left(1 + \frac{10\%}{12}\right)^{1,5\times12}\left(1 + \frac{8\%}{4}\right)^{2,5\times4}$ $- 3000\left(1 + \frac{8\%}{4}\right)^{1\times4}$ $\approx$ R 25 060,49	✓ $20\,000\left(1 + \frac{10\%}{12}\right)^{1,5\times12}$ **A** ✓ $\left(1 + \frac{8\%}{4}\right)^{2,5\times4}$ **A** ✓**M** **A** ✓ $\left(1 + \frac{8\%}{4}\right)^{1\times4}$ **A** ✓$\approx$ R 25 060,49 **CA**
OR/*OF*	**OR/*OF***
$A = \left[20\,000\left(1 + \frac{10\%}{12}\right)^{1,5\times12}\left(1 + \frac{8\%}{4}\right)^{1,5\times4} - 3000\right]$ $\times\left(1 + \frac{8\%}{4}\right)^{1\times4}$ $\approx$ R 25 060,49	✓ $20\,000\left(1 + \frac{10\%}{12}\right)^{1,5\times12}$ **A** ✓ $\left(1 + \frac{8\%}{4}\right)^{1,5\times4}$ **A** ✓**M** **A** ✓ $\left(1 + \frac{8\%}{4}\right)^{1\times4}$ **A** ✓$\approx$ R 25 060,49 **CA**
	(5)
	[17]

QUESTION/*VRAAG* 6

6.1	$f(x) = 9x - 6$ $f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \to 0} \frac{9(x+h) - 6 - (9x - 6)}{h}$ $= \lim_{h \to 0} \frac{9x + 9h - 6 - 9x + 6}{h}$ $= \lim_{h \to 0} \frac{9h}{h}$ $= \lim_{h \to 0} (9)$ $\therefore f'(x) = 9$	✓definition/*definisie* **A** ✓ **SF** **A** ✓ **S** **CA** ✓**S** **CA** ✓ 9 **CA** **Penalty: 1 mark for incorrect notation/** ***Penaliseer : 1 punt vir foutiewe notasie*** **AO: 1mark/*punt*** (5)
6.2	$f(x) = 11\pi^2$ $f'(x) = 0$	✓ 0 **A** (1)
6.3.1	$y = x\left(3 + \frac{3}{x^5}\right)$ $= 3x + 3x^{-4}$	✓ $3x$ **A** ✓ $3x^{-4}$ or/*of* $\frac{3}{x^4}$ **A** (2)
6.3.2	$\frac{dy}{dx} = 3 - 12x^{-5}$	✓ 3 **CA** ✓ $-12x^{-5}$ or/*of* $-\frac{12}{x^5}$ **CA** (2)
6.4.1	$\sqrt[5]{x^8} = x^{\frac{8}{5}}$	✓ $x^{\frac{8}{5}}$ **A** (1)
6.4.2	$D_x\left[x^{\frac{8}{5}} - 5x^{12}\right]$ $= \frac{8}{5}x^{\frac{3}{5}} - 60x^{11}$	✓ $\frac{8}{5}x^{\frac{3}{5}}$ **CA** ✓ $-60x^{11}$ **A** (2)

6.5.1	$g(x) = -x^3 + 6x^2$ $g'(x) = -3x^2 + 12x$	✓ $-3x^2$ **A** ✓ $12x$ **A** (2)
6.5.2	$g'(-2) = -3(-2)^2 + 12(-2)$ $= -36$	✓ Sub. into derivative / *vervang in afgeleide* **CA** ✓ -36 **CA** **AO: Full marks/*Volpunte*** (2)
6.5.3	$-3x^2 + 12x = -36$ $-3x^2 + 12x + 36 = 0$ $-3(x-6)(x+2) = 0$ **OR/*OF*** $x = \frac{-(12) \pm \sqrt{(12)^2 - 4(-3)(36)}}{2(-3)}$ $\therefore\ x = 6$ $y = g(6) = -(6)^3 + 6(6)^2 = 0$ The other point is /*Die ander punt* is $(6\ ;\ 0)$	✓equating / *gelykstelling* **CA** ✓factors/formula/*faktore* **CA** ✓*x*-coordinate of other point / *x-koördinaat van ander punt* **CA** ✓ *y*-coordinate of other point / *y-koördinaat van ander punt* **CA** (4)
		[21]

QUESTION/*VRAAG* 7

7.1	OD = 60 units/ *eenhede*	✓length/ *lengte* **A** (1)
7.2	x - intercepts / *afsnitte* $y = 0$ $(x + 2)(x^2 - x - 30) = 0$ $(x + 2)(x - 6)(x + 5) = 0$ **OR/*OF*** $x + 2 = 0$ or/*of* $x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(1)(-30)}}{2(1)}$ $\therefore x = -2$ or/*of* $x = 6$ or/*of* $x = -5$ $\therefore \text{A}(-5;0)$ and/*en* $\therefore \text{C}(6;0)$	✓ quadratic factor/ *kwdr. faktor* **A** ✓ factors/ *faktore* / **SF** **CA** ✓ coordinates of/*koördinate van* A **CA** ✓ coordinates of/*koördinate van* C **CA** **AO: Full marks/*Volpunte*** (4)
7.3	$f'(x) = 3x^2 + 2x - 32 = 0$ $x = \frac{-(2) \pm \sqrt{(2)^2 - 4(3)(-32)}}{2(3)}$ $\therefore x \approx -3{,}62$ or/*of* $x \approx 2{,}95$ $f(2{,}95) = (2{,}95)^3 + (2{,}95)^2 - 32(2{,}95) - 60 \approx -120{,}03$ $\therefore \text{G}(-3{,}62\ ;-120{,}03)$	✓derivative/*afgeleide* **A** ✓equating derivative to 0/ *stel afgeleide gelyk aan 0* **A** ✓**SF** **CA** ✓ both values of /*beide waardes van x* **CA** ✓correct value of / *korrekte waarde van y* **CA** ✓ coordinates of/*koördinate van* G **CA** **NPR** (6)
7.4.1	$-5 \le x \le -2$ **OR/*OF*** $x \in [-5\ ;\ -2]$ **OR/*OF*** $x \ge -5$ and/*en* $x \le -2$ Accept**:** From -5 to -2 / *Aanvaar*: *Vanaf* -5 *tot* -2	✓ critical values/*kritieke waardes* **CA** ✓ correct notation/*korrekte notasie* **A** (2)
7.4.2	$-3{,}62 < x < 2{,}95$ **OR/*OF*** $x \in (-3{,}62\ ;\ 2{,}95)$ **OR/*OF*** $x > -3{,}62$ and/*en* $x < 2{,}95$ Accept**:** Between $-3{,}62$ and $2{,}95$ / *Aanvaar*: *Tussen* $-3{,}62$ *en* $2{,}95$	✓ critical values/*kritieke waardes* **CA** ✓ correct notation/*korrekte notasie* **A** **NPR** (2)
		[15]

QUESTION/*VRAAG* 8

8.1	R10 000 **Refer to the Addendum/** ***Verwys na die Addendum***	✓R10 000 **A** (1)
8.2	$P'(x) = -60x^2 + 6\,000$	✓ derivative/ *afgeleide* **A** (1)
8.3	For maximum / *Vir maksimum:* $P'(x) = 0$ $-60x^2 + 6\,000 = 0$ $-60(x+10)(x-10) = 0$ **OR/*OF*** $x = \dfrac{-(0) \pm \sqrt{(0)^2 - 4(-60)(6\,000)}}{2(-60)}$ **OR/*OF*** $x^2 = \dfrac{6\,000}{60}$ $x = 10$ or/*of* $x \neq -10$ $P(10) = -20(10)^3 + 6\,000(10) - 10\,000$ $= \text{R}30\,000$	✓ equating derivative to/ *stel afgeleide aan* 0 **A** ✓factors/*faktore* /**SF** **CA** ✓ correct value of *x*/ *korrekte waarde vir x* **CA** ✓**SF** **CA** ✓ Maximum Profit / *maksimum wins* **CA** **NPU** (5)
		[7]

QUESTION/*VRAAG* 9

9.1.1	$\int -\frac{6}{x}\ dx = -6\ln x + C$	✓ $-6\ln x$ **A** ✓ C **A** (2)
9.1.2	$\int (3x-4)(x+2)\ dx$ $= \int (3x^2 + 2x - 8)dx$ $= x^3 + x^2 - 8x + C$	✓ **S** **A** ✓ x^3 **CA** ✓ x^2 **CA** ✓ $-8x + C$ **CA** (4)
9.2.1	$\int 2^x\ dx = \frac{2^x}{\ln 2} + C$	✓ $\frac{2^x}{\ln 2} + C$ **A** (1)
9.2.2	$A = \int_{-2}^{0} f(x)\ dx = \int_{-2}^{0} 2^x\ dx$ $= \left[\frac{2^x}{\ln 2}\right]_{-2}^{0}$ $= \left[\frac{2^0}{\ln 2}\right] - \left[\frac{2^{-2}}{\ln 2}\right] = \frac{\frac{3}{4}}{\ln 2}$ $= \frac{\frac{3}{4}}{\ln 2}$ **OR/*OF*** $\approx 1,08$ units^2 / *eenhede*^{2} $B = \int_{2}^{3} f(x)\ dx = \int_{2}^{3} 2^x\ dx = \left[\frac{2^x}{\ln 2}\right]_{2}^{3}$ $= \left[\frac{2^3}{\ln 2}\right] - \left[\frac{2^2}{\ln 2}\right] = \frac{4}{\ln 2}$ $= \frac{4}{\ln 2}$ **OR/*OF*** $\approx 5,77$ units^2 / *eenhede*^{2} $\therefore \frac{B}{A} = \frac{4}{\ln 2} - \frac{\frac{3}{4}}{\ln 2} = \frac{16}{3}$ **OR/*OF*** $\therefore \frac{B}{A} = \frac{5,77}{1,08} = 5,34$ **OR/*OF***	✓Area notation using integrals/*Area-notasie met gebruik van integrale* **M** ✓ **SF** **CA** ✓ A value / *waarde* **CA** ✓ **SF** **CA** ✓ B value / *waarde* **CA** ✓ **M** **CA**

	$B-4A = \frac{4}{\ln 2} - 4\left(\frac{\frac{3}{4}}{\ln 2}\right)$ **OR/*OF*** $\approx 5,77 - 4(1,08)$ $= \frac{1}{\ln 2}$ $\approx 1,45$ **OR/*OF*** $B > 4A \quad \frac{4}{\ln 2} > 4\left(\frac{\frac{3}{4}}{\ln 2}\right)$ **OR/*OF*** $5,77 > 4(1,08)$ $\frac{4}{\ln 2} > \frac{3}{\ln 2}$ $5,77 > 4,32$ $\therefore$ The learner's claim is **NOT VALID** / *Die leerder se bewering is **NIE GELDIG NIE**.*	✓Conclusion / *Gevolgtrekking* **CA** (7)
		[14]
	TOTAL/*TOTAAL*	**[150]**