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 2021

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 21 pages.
Hierdie nasienriglyne bestaan uit 21 bladsye.

NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- The method of consistent accuracy marking must be applied to all aspects of the marking guideline where applicable as indicated with the marking code **CA**.
- If a candidate strikes off a response to a question and does not attempt the question again, then the struck off question should be marked.
- # Shows questions where Tolerance Range will be applied**:**
  3.3.2 ; 5.2 ; 5.3.2 ; 9.2

LET WEL:

- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord, sien slegs die EERSTE poging na.*
- *Die metode van volgehoue akkuraatheid-nasien moet waar moontlik op alle aspekte van die nasienriglyne toegepas word soos aangedui deur die nasienkode* **CA.**
- *Indien 'n kandidaat 'n antwoord deurhaal en nie poog om die vraag weer te beantwoord dan moet die deurgehaalde antwoord gemerk word.*
- *# Toon vrae waar Toleransie Wydte (Verdraagsaamheids omvang) toegepas word**:***
  3.3.2 ; 5.2 ; 5.3.2 ; 9.2

QUESTION/*VRAAG* 1

1.1.1	$2x(x+3)=0$ $x=0$ or/*of* $x=-3$	✓ $x=0$ **A** ✓ $x=-3$ **A** (2)
1.1.2	$x(x+9)=12$ $x^2+9x-12=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\frac{-(9)\pm\sqrt{(9)^2-4(1)(-12)}}{2(1)}$ $=\frac{-9\pm\sqrt{129}}{2}$ $\therefore x\approx 1{,}18$ or/*of* $x\approx -10{,}18$	✓ standard form/*standaardvorm* **A** ✓ **SF** **CA** ✓ ✓ each x -value/*elke waarde* **CA** **R** (4)
1.1.3	$x(6-x)\geq 0$ Critical values/*kritiese waardes*: 0 and 6 $\therefore 0\leq x\leq 6$ **OR/*OF*** $x\in[0;6]$ **OR/*OF*** $x\geq 0$ and/*en* $x\leq 6$  	✓ both critical values/ *albei kritiese waardes* **A** ✓ notation/*notasie* **A** ✓ number line representation/ *getallelyn voorstelling* **CA** **Note: Award full marks if ONLY the correct number line representation is shown.** ***Nota: Ken vol punte toe SLEGS as korrekte getallelyn getoon word*** (3)

1.2	$x = 1 - 2y$ and/*en* $3x^2 = 3 + x + y$ $3(1-2y)^2 = 3 + (1-2y) + y$ $3 - 12y + 12y^2 = 4 - y$ $12y^2 - 11y - 1 = 0$ $(12y+1)(y-1) = 0$ **OR/*OF*** $y = \frac{-(-11) \pm \sqrt{(-11)^2 - 4(12)(-1)}}{2(12)}$ $\therefore y = -\frac{1}{12} \approx -0,08$ or/*of* $y = 1$ $x = 1 - 2(-\frac{1}{12})$ or/*of* $x = 1 - 2(1)$ $\therefore x = \frac{7}{6} \approx 1,17$ or/*of* $x = -1$ **OR/*OF*** $y = \frac{1-x}{2}$ and/ *en* $3x^2 = 3 + x + y$ $3x^2 = 3 + x + \frac{1-x}{2}$ $6x^2 = 6 + 2x + 1 - x$ $6x^2 - x - 7 = 0$ $(6x-7)(x+1) = 0$ **OR/OF** $x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(6)(-7)}}{2(6)}$ $\therefore x = \frac{7}{6} \approx 1,17$ or/*of* $x = -1$ $y = \frac{1-\frac{7}{6}}{2}$ or/*of* $y = \frac{1-(-1)}{2}$ $\therefore y = -\frac{1}{12} \approx -0,08$ or/*of* $y = 1$ **OR/*OF*** $x = 1 - 2y \ (1)$ and / *en* $3x^2 - 3 - x = y \ (2)$ Sub/*verv* (2) into/*in* (1) $x = 1 - 2\left(3x^2 - 3 - x\right)$ $x = 1 - 6x^2 + 6 - 2x$ $6x^2 - x - 7 = 0$ $(6x-7)(x+1) = 0$ $\therefore x = \frac{7}{6} \approx 1,17$ or/*of* **OR/*OF*** $x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(6)(-7)}}{2(6)}$ $\therefore y = -\frac{1}{12} \approx -0,08$ or/*of* $y = 1$	✓ substitution/*vervanging* **A** ✓ **S** **CA** ✓correct standard form/ *korrekte standaard vorm* **CA** ✓ factors/formula / *faktore/formule.* **CA** ✓ both *y*-values/-*waardes* **CA** ✓ both *x*-values/-*waardes* **CA** **OR/*OF*** ✓ substitution/ *vervanging* **A** ✓ **S** **CA** ✓ correct standard form/ *korrekte standaardvorm* **CA** ✓ factors/form./*faktore/form.* **CA** ✓ both *x*-values/-*waarde* **CA** ✓ both *y*-values/-*waardes* **CA** **OR/*OF*** ✓ substitution/ *vervanging* **A** ✓ **S** **CA** ✓ correct standard form/ *korrekte standaardvorm* **CA** ✓ factors/form./*faktore/form.* **CA** ✓ both *x*-values/-*waarde* **CA** ✓ both *y*-values/-*waardes* **CA** **NPR** (6)

1.3.1	$T = 2\pi\sqrt{\frac{L}{g}}$ $\frac{T}{2\pi} = \sqrt{\frac{L}{g}}$ $\left(\frac{T}{2\pi}\right)^2 = \left(\frac{L}{g}\right)^2$ $L = g \cdot \left(\frac{T}{2\pi}\right)^2$ **OR/*OF*** $T = 2\pi\sqrt{\frac{L}{g}}$ $(T)^2 = \left(2\pi\sqrt{\frac{L}{g}}\right)^2$ $T^2 = 4\pi^2\frac{L}{g}$ $L = \frac{gT^2}{4\pi^2}$	✓ **M** squaring both sides/ *kwadreer beide kante* **A** ✓ *L* subject/ *onderwerp* **A** **OR/*OF*** ✓ **M** squaring both sides/ *kwadreer beide kante* **A** ✓ *L* subject/ *onderwerp* **A** (2)
1.3.2	$L = g \cdot \left(\frac{T}{2\pi}\right)^2$ $L = 9,8 \cdot \left(\frac{1,74}{2\pi}\right)^2$ $L = 0,75m$ **OR/*OF*** $L = \frac{gT^2}{4\pi^2}$ $L = \frac{(9,8)(1,74)^2}{4\pi^2}$ $L = 0,75m$ **OR/*OF***	✓ **SF** **CA** ✓ value of/*waarde van L* **CA** **OR/*OF*** ✓ **SF** **CA** ✓ value of/*waarde van L* **CA** **OR/*OF***

	$T = 2\pi\sqrt{\frac{L}{g}}$ $1{,}74 = 2\pi\sqrt{\frac{L}{9{,}8}}$ $L = 9{,}8\cdot\left(\frac{1{,}74}{2\pi}\right)^2$ $L = 0{,}75m$	✓ **SF** **A** ✓ value of/*waarde van L* **CA** **NPR** **NPU** (2)
1.4.1	$1101100_2 - 11100_2 = 1010000_2$	✓ 1010000_2 **A** **Note: No penalty if base 2 is omitted.** ***Nota: geen penaliseering indien basis 2 uitgelaat is*** (1)
1.4.2	2^6 | 2^5 | 2^4 | 2^3 | 2^2 | 2^1 | 2^0 1 | 0 | 1 | 0 | 0 | 0 | 0 $= 64 + 16 = 80$ **OR/*OF*** 2^6 | 2^5 | 2^4 | 2^3 | 2^2 | 2^1 | 2^0 | 1 | 1 | 0 | 1 | 1 | 0 | 0 | =108 | | 1 | 1 | 1 | 0 | 0 | =28 $= 108 - 28 = 80$	✓ **M** **CA** ✓ decimal value/*desimale waarde* **CA** **OR/*OF*** ✓ **M** **A** ✓ decimal value/*desimale waarde* **CA** **AO: full marks/ *vol punte*** (2) **[22]**

QUESTION/*VRAAG* 2

2.1.1	Non-real/ *nie-reël*	✓ non-real/ *nie-reël* (1)
2.1.2	Real, rational, equal *Reëel, rasionaal, gelyk*	✓ Real, rational, equal/ *Reëel, rasionaal, gelyk* **A** (1)
2.2	$-x^2+2qx-4=0$ **OR/*OF*** $x^2-2qx+4=0$ $b^2-4ac<0$ $(2q)^2-4(-1)(-4)<0$ **OR/*OF*** $(-2q)^2-4(1)(4)<0$ $4q^2-16<0$ $q^2-4<0$ $(q-2)(q+2)<0$ $-2<q<2$ **OR/*OF*** $q\in(-2;2)$ **OR/*OF*** $q>-2$ and $q<2$	✓ $\Delta<0$ **A** ✓ **SF** **A** ✓end points and correct notation/ *eindpunte en korrekte notasie* **CA** (3) **[5]**

QUESTION/*VRAAG* 3

3.1.1	$\left(81a^{-8}\right)^{-\frac{3}{4}}$ $=\left(3^4a^{-8}\right)^{-\frac{3}{4}}$ $= 3^{-3}a^{6}$ **OR/*OF*** $\frac{1}{27}a^{6}$ **OR / *OF*** $\frac{a^{6}}{27}$	✓ Prime base or exponential property/ *priembasis of eksponensiële eienskap* **A** ✓ 3^{-3} **CA** ✓ a^{6} **A** **AO: 2 marks/*punte*** (3)
3.1.2	$\log_2 16+\log_3 4^0$ $=\log_2 2^4+\log_3 1$ $=4\log_2 2+\log_3 1$ $=4(1)+0$ $=4$ **OR/*OF*** $\log_2 16+\log_3 4^0$ $=\log_2 2^4+0\log_3 4$ $=4\log_2 2+0\log_3 4$ $=4(1)+0$ $=4$ **OR/*OF*** $\log_2 16+\log_3 4^0$ $=\frac{\log 16}{\log 2}+\frac{\log 4^0}{\log 3}$ $=\frac{\log 2^4}{\log 2}+\frac{\log 1}{\log 3}$ $=\frac{4\log 2}{\log 2}+\frac{0}{\log 3}$ $=4+0$ $=4$	✓ $\log_2 2^4$ **A** ✓ $\log_3 1$ **A** ✓ $\log_2 2=1$ **CA** ✓ 4 **CA** **OR/*OF*** ✓ $\log_2 2^4$ **A** ✓ $4\log_2 2+0\log_3 4$ **A** ✓ $\log_2 2=1$ **CA** ✓ 4 **CA** **OR/*OF*** ✓ $\frac{\log 2^4}{\log 2}$ **A** ✓ $\frac{\log 1}{\log 3}$ **A** ✓ $\frac{4\log 2}{\log 2}$ **CA** ✓ 4 **CA** **AO: 3 marks/*punte*** (4)

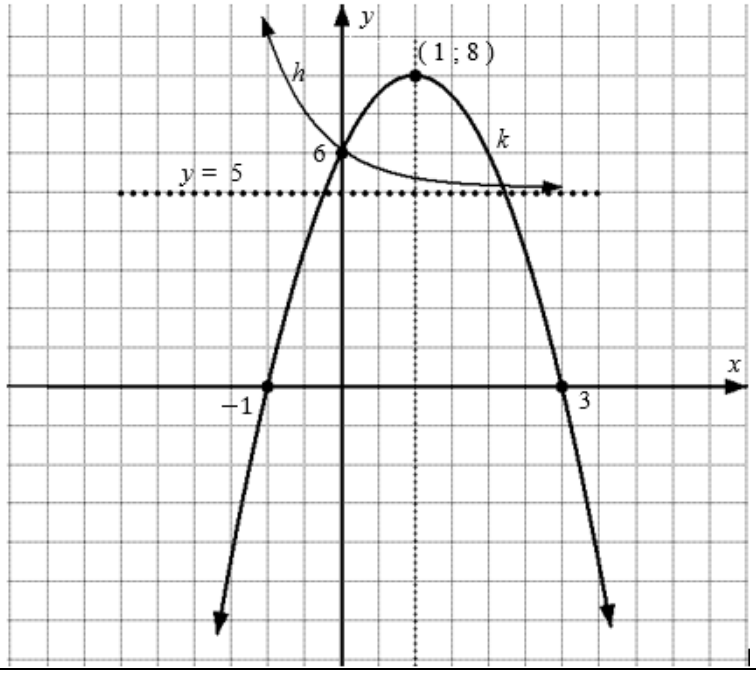
3.1.3	$\sqrt{50x^{10}} \times \sqrt{18x^{-4}}$ $= \sqrt{900x^6}$ $= 30x^3$ **OR/*OF*** $\sqrt{50x^{10}} \times \sqrt{18x^{-4}}$ $= \sqrt{25 \times 2x^{10}} \times \sqrt{9 \times 2x^{-4}}$ $= 5\sqrt{2}x^5 \times 3\sqrt{2}x^{-2}$ $= 30x^3$	✓ Product of the surds/ *produk van wortelvorm* **A** ✓ 30 **CA** ✓ x^3 **CA** **OR/*OF*** ✓ Product of perfect squares and prime number/ *produk van volkome vierkante en priem getalle* **A** ✓ 30 **CA** ✓ x^3 **CA** (3)
3.2	$\log_3(x+2) = 2 + \log_3 x$ $\log_3(x+2) - \log_3 x = 2$ $\log_3 \frac{x+2}{x} = 2$ $\frac{x+2}{x} = 3^2$ **OR/*OF*** $\log_3 \frac{x+2}{x} = 2\log_3 3$ $x+2 = 9x$ $x = \frac{1}{4}$ **OR/*OF*** $x = 0{,}25$ **OR/*OF*** $\log_3(x+2) = 2 + \log_3 x$ $\log_3(x+2) = 2\log_3 3 + \log_3 x$ $\log_3(x+2) = \log_3 9 + \log_3 x$ $\log_3(x+2) = \log_3 9x$ $x+2 = 9x$ $x = \frac{1}{4}$ **OR/*OF*** $x = 0{,}25$	✓ log property/*log-eienskap* **A** ✓exponential/log form/ *eksponensiële /log vorm* **CA** ✓ **S** **CA** ✓ x – value/*waarde* **CA** **OR/*OF*** ✓ log property/*log-eienskap* **A** ✓ log property/*log-eienskap* **A** ✓ **S** **CA** ✓ x – value/*waarde* **CA** (4)
3.3.1	$\lvert z \rvert = r = \sqrt{x^2 + y^2}$ $2\sqrt{5} = \sqrt{(p)^2 + (4)^2}$ $20 = p^2 + 16$ $p^2 = 4$ OR / OF $(p+2)(p-2) = 0$ OR / *OF* $p = \pm\sqrt{4}$ $p = \pm 2$ $\therefore p = -2$, $\theta \in (90^\circ; 180^\circ)$	✓ **SF** **A** ✓ **S** **CA** ✓ **S** **CA** ✓ – 2 **CA** (4)

3.3.2 #	$\tan\theta = \frac{y}{x}$ **OR/*OF*** $\cos\theta = \frac{x}{r}$ $\tan\theta = \frac{4}{-2}$ **OR/*OF*** $\cos\theta = \frac{-2}{2\sqrt{5}}$ $\text{ref.angle / } \textit{verw. hoek} = 63,43^{\circ}$ $\theta = 180^{\circ} - 63,43^{\circ} = 116,57^{\circ}$ **OR/*OF*** $2,03\ rad$ $\therefore z = 2\sqrt{5}\,cis\ 116,57^{\circ}$ **OR/*OF*** $\therefore z = 2\sqrt{5}\,cis\ 2,03\ rad$ **OR/*OF*** $\sin\theta = \frac{y}{r}$ $\sin\theta = \frac{4}{2\sqrt{5}}$ $\text{ref.angle / } \textit{verw. hoek} = 63,43^{\circ}$ $\theta = 180^{\circ} - 63,43^{\circ} = 116,57^{\circ}$ **OR/*OF*** $2,03\ rad$ $\therefore z = 2\sqrt{5}\,cis\ 116,57^{\circ}$ **OR/*OF*** $\therefore z = 2\sqrt{5}\,cis\ 2,03\ rad$	✓ ref. angle/*verw. hoek* **CA** ✓ value of/ waarde van θ **CA** ✓ z in polar form/*polêre vorm* **CA** **OR/*OF*** ✓ ref. angle / *verw. hoek* **A** ✓ value of/ *waarde van* θ **CA** ✓ z in polar form/*polêre vorm* **CA** (3)
3.4	$2m - ni - 6i = -3i(4i + 5)$ $2m - ni = -12i^2 - 15i + 6i$ $2m - ni = -12(-1) - 9i$ $2m - ni = 12 - 9i$ $\therefore\ 2m = 12$ $m = 6$ $\therefore -ni = -9i$ $n = 9$ **OR/*OF*** $2m - ni - 6i = -3i(4i + 5)$ $2m - (n+6)i = -12i^2 - 15i$ $2m - (n+6)i = -12(-1) - 15i$ $2m - (n+6)i = 12 - 15i$ $\therefore\ 2m = 12$ $m = 6$ $\therefore -(n+6)i = -15i$ $n = 9$	✓ Product/ *produk* **A** ✓ substituting i^2 with – 1/ *vervang* i^2 *met* – 1 **A** ✓ value of/ *waarde van m* **CA** ✓ value of/ *waarde van n* **CA** **OR/*OF*** ✓ Product/ *produk* **A** ✓ substituting i^2 with – 1/ *vervang* i^2 *met* – 1 **A** ✓ value of/ *waarde van m* **CA** ✓ value of/ *waarde van n* **CA**

	OR/*OF*	**OR/*OF***
	$2m-ni-6i=-3i(4i+5)$	
	$2m-(n+6)i=-12i^2-15i$	✓ Product/ *produk* **A**
	$2m-ni-6i=-12(-1)-15i$	✓ substituting i^2 with – 1/ *vervang* i^2 *met* – 1 **A**
	$2m-ni-6i=12-15i$	
	$\therefore\ 2m-12=ni+6i-15i$	
	$2m-12=0$ and / *en* $ni-9i=0$	
	$\therefore\ 2m=12$	
	$m=6$	✓ value of/ *waarde van m* **CA**
	$\therefore\ ni=9i$	
	$n=9$	✓ value of/ *waarde van n* **CA** (4) **[25]**

QUESTION/*VRAAG* 4

4.1.1(a)	$y = 6$ **OR/*OF*** $(0;6)$	✓ 6	**A** (1)
4.1.1(b)	$y = 5$	✓ $y = 5$	**A** (1)
4.1.1(c)	$k(x) = -2x^2 + 4x + 6$ $y-$int / *afsn.*: $y = 6$ $x-$ints/*afsn..*: $-2x^2 + 4x + 6 = 0$ $x^2 - 2x - 3 = 0$ $(x+1)(x-3) = 0$ **OR/*OF*** $x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-3)}}{2(1)}$ $x = -1$ *or / of* $x = 3$	✓ *y*-int./ *afsn.* ✓factors/form./*faktore/form.* ✓ both values of/ *beide waardes van x*	**A** **A** **CA** (3)
4.1.1(d)	TP/*DP*, $x = \frac{-b}{2a} = \frac{-(4)}{2(-2)}$ $= 1$ $y = -2(1)^2 + 4(1) + 6 = 8$ $\therefore (1;8)$ **OR/*OF*** TP/*DP*, $x = \frac{-1+3}{2} = 1$ $y = -2(1)^2 + 4(1) + 6 = 8$ $\therefore (1;8)$ **OR/*OF*** $k(x) = -2x^2 + 4x + 6$ $k'(x) = -4x + 4 = 0$ $x = 1$ $y = -2(1)^2 + 4(1) + 6 = 8$ $\therefore (1;8)$ **OR/*OF*** $\left(\frac{-b}{2a}; \frac{4ac - b^2}{4a}\right)$ $\left(\frac{-(4)}{2(-2)}; \frac{4(-2)(6) - (4)^2}{4(-2)}\right)$ $\therefore (1;8)$	✓**SF** ✓ *x*-value/*waarde* ✓ *y*-value/ *waarde* **OR/*OF*** ✓ **M** ✓ *x*-value/*waarde* ✓ *y*-value/ *waarde* **OR/*OF*** ✓ **M** ✓ *x*-value/*waarde* ✓ *y*-value/ *waarde* **OR/*OF*** ✓**SF** ✓ *x*-value/*waarde* ✓ *y*-value/ *waarde*	**A** **CA** **CA** **CA** **CA** **CA** **A** **CA** **CA** **A** **CA** **CA** (3)

4.1.2		*h* : ✓ shape/*vorm* **A** ✓ *y*- int./*afsn* **CA** ✓ asymptote/ *asimptote* **CA** *k*: ✓ shape/*vorm* **A** ✓ *x* & *y* int../*afsn* **CA** ✓Turning point/ *draaipt* **CA** (6)
4.1.3	$p(x) = \frac{a}{x} + q$ and/*en* $(-1;8)$ $q = 5$ $8 = \frac{a}{-1} + 5$ $\therefore a = -3$	✓ value of/ *waarde van q* **A** ✓ **SF** **A** ✓ value of/ *waarde van a* **CA** (3)
4.2.1	$C(5;0)$	✓ *x*-value at/*waarde by* C **A** ✓ *y*-value at/ *waarde by* C **A** (2)
4.2.2	$D(0;-10)$ and/*en* $B(0;-5)$ $\therefore BD = -5-(-10) = 5$ *units / eenhede*	✓coordinates of/ *koördinate van* B & D **CA** ✓ length of/ *lengte van* BD **CA** **AO: Full marks/*Volpunte*** (2)
4.2.3	$f(x) = -\sqrt{25-x^2}$ **OR/*OF*** $f(x) = -\sqrt{5^2-x^2}$	✓ equation/*vergelyking* **CA** (1)
4.2.4	$3 < x < 5$ **OR/*OF*** $x \in (3;5)$ **OR/*OF*** $x > 3$ and $x < 5$	✓ critical values/ *kritiese waardes* **CA** ✓ correct notation/ *korrekte notasie* **A** (2)
		[24]

QUESTION/*VRAAG* 5

5.1.1	$\frac{4}{23} \approx 17,39\ \%$	✓ $17,39\ \%$ **A** **NPR** (1)
5.1.2	$A = P(1+i\,n)$ $A = R63\ 150\left(1+\frac{4}{23}\times 7\right)$ **OR/*OF*** $R63\ 150\ (1+17,39\ \%\times 7)$ $\approx R140\,028,\ 26$ $\approx R140\,022,50$ **OR/*OF*** $SI\ /\ ER = P\times i\times n$ $= R63\ 150\times\frac{4}{23}\times 7$ **OR/*OF*** $= R63\,150\times 17,39\%\times 7$ $\approx R76\ 878,26$ $\approx R76\ 872,50$ $\therefore A\approx R63\ 150 + R76\,878,26$ **OR/*OF*** $R\,63150 + R\,76\,872,50$ $\approx R140\ 028,26$ $\approx R140\ 022,50$	✓ **SF** **A** ✓ $R140\,028,\ 26$ **CA** **OR/*OF*** ✓ **SF** **A** ✓ $R140\,028,\ 26$ **CA** **NPR** (2)
5.2 #	$A = P(1-i)^n$ $R274\ 000 = R726\ 900(1-15,8\%)^n$ $\frac{2\ 740}{7\ 269} = (1-15,8\%)^n$ $n = \frac{\log\left(\frac{2\ 740}{7\ 269}\right)}{\log(0,842)}$ $n \approx 5,67$ $\therefore n > 5,67$ years/*jare*	✓ **SF** **A** ✓ **S** **CA** ✓ log form/*vorm* **CA** ✓ value of/ *waarde van n* **CA** (4)
5.3.1	$A = P(1+i)^n$ $= R25\,000\ (1+2,8\%)^4$ $= R\ 27\ 919,81$	✓ **SF** **A** ✓ R 27 919,81 **CA** (2)

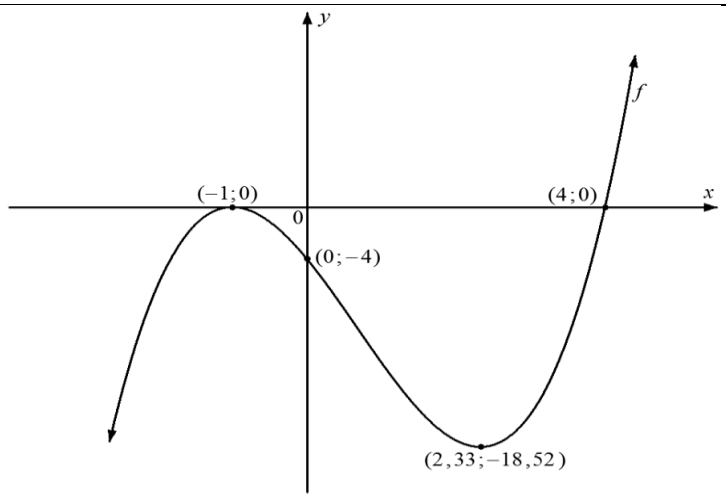
5.3.2	Value of investment after 27 months/ *Waarde van belegging na* 27 *maande*	
#	$A = P(1+i)^n$	
	$= R15\,000\left(1+\frac{5,98\%}{12}\right)^{27}$	✓ $\left(1+\frac{5,98\%}{12}\right)^{27}$ **A**
	$\approx R17\,154,59482$	✓value of/ *waarde van* A **CA**
	Value of investment after 21 months/ *Waarde van belegging na* 21 *maande*	
	$P = R17154,59482 + R6823,54 \approx R23978,13482$	✓**M** adding/ *byvoeging* R6 823,54 **A**
	Value of investment after 7 quarters/ *Waarde van belegging na* 7 *kwartale*	
	$= R23\,978,13482\left(1+\frac{7,78\%}{4}\right)^{7}$	✓ $\left(1+\frac{7,78\%}{4}\right)^{7}$ **A**
	$\approx R27\,439,55$	
	$\therefore$ R27 439, 55 < R 27 919,81	✓ value of/ *waarde van* A **CA**
	He will not have enough money/ *hy sal nie genoeg geld hê nie*	✓conclusion/ *gevolgtrekking* **CA**
	OR/*OF*	**OR/*OF***
	$A = R15\,000\left(1+\frac{5,98\%}{12}\right)^{27}\left(1+\frac{7,78\%}{4}\right)^{7}$	✓ $\left(1+\frac{5,98\%}{12}\right)^{27}$ **A**
		✓ $\left(1+\frac{7,78\%}{4}\right)^{7}$ **A**
	$+R6\,823,54\left(1+\frac{7,78\%}{4}\right)^{7}$	✓ **M** **A**
	$\approx R27\,439,55$	✓ $\left(1+\frac{7,78\%}{4}\right)^{7}$ **A**
	$\therefore$ R27 439, 55 < R 27 919,81	✓ ≈ R27 439, 55 **CA**
	He will not have enough money/ *hy sal nie genoeg geld hê nie*	✓conclusion/*gvlgtr* **CA**
	OR/*OF*	**OR/*OF***
	$A = \left[R15\,000\left(1+\frac{5,98\%}{12}\right)^{27} + R6\,823,54\right]\left(1+\frac{7,78\%}{4}\right)^{7}$	✓ $\left(1+\frac{5,98\%}{12}\right)^{27}$ **A**
		✓ **M** **A**
	$\approx R27\,439,55$	✓ **M** **A**
	$\therefore$ R27 439, 55 < R 27 919,81	✓ $\left(1+\frac{7,78\%}{4}\right)^{7}$ **A**
	He will not have enough money/ *hy sal nie genoeg geld hê nie*	✓ ≈ R27 439, 55 **CA**
		✓conclusion/*gvlgtr* **CA**
	Conclusion without calculation: 0 marks/ *Gevolgtrekking sonder berekeninge gee: 0 punte*	(6)
		[15]

QUESTION/*VRAAG* 6

6.1	$f(x) = -3x$ $f'(x) = \lim_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $= \lim_{h\to 0}\frac{-3(x+h)-(-3x)}{h}$ $= \lim_{h\to 0}\frac{-3x-3h+3x}{h}$ $= \lim_{h\to 0}\frac{-3h}{h}$ $= \lim_{h\to 0}(-3)$ $\therefore f'(x) = -3$	✓definition/*definisie* **A** ✓ **SF** **CA** ✓ **S** **CA** ✓**S** **CA** ✓ -3 **CA** **AO**: **1 mark/** ***punt*** **Penalty of one mark for incorrect notation** ***Penaliseer een punt indien notasie foutief is.*** (5)
6.2.1	$D_x\left[p^3x^2 - 7x + 10\right]$ $= 2p^3x - 7$	✓ $2p^3x$ **A** ✓ -7 **A** (2)
6.2.2	$y = \frac{x-3x^2}{x^7}$ $y = x^{-6} - 3x^{-5}$ $\frac{dy}{dx} = -6x^{-7} + 15x^{-6}$	✓ **S** **A** ✓ $-6x^{-7}$ **CA** ✓ $15x^{-6}$ **CA** (3)
6.2.3	$f(x) = \sqrt[3]{x^2} + 5x^4$ $f(x) = x^{\frac{2}{3}} + 5x^4$ $\therefore f'(x) = \frac{2}{3}x^{-\frac{1}{3}} + 20x^3$	✓ $x^{\frac{2}{3}}$ **A** ✓ $\frac{2}{3}x^{-\frac{1}{3}}$ **CA** ✓ $20x^3$ **A** (3)

6.3.1	$m = -9$	✓ value of/ *waarde van m* **A** (1)
6.3.2	$y = x^2 + 3x - 2$ $\frac{dy}{dx} = 2x + 3$ $2x + 3 = -9$ $2x = -12$ $\therefore x = -6$ $y = (-6)^2 + 3(-6) - 2$ $\therefore y = 16$ $(-6\,;16)$	✓ derivative of / *afgeleide van y* **A** ✓ equat.deriv/ *verg. afgeleide* $= -9$ **CA** ✓ value of/ *waarde van x* **CA** ✓ value of/ *waarde van y* **CA** (4)
6.3.3	$g(x) = x^2 + 3x - 2$ $g(x) = (-2)^2 + 3(-2) - 2 = -4$ $g(x) = (3)^2 + 3(3) - 2 = 16$ Ave. grad./*Gem grad* $= \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{16 - (-4)}{3 - (-2)}$ $= \frac{20}{5}$ $= 4$ **OR/*OF*** $g(x) = x^2 + 3x - 2$ Ave. grad./*Gem grad* $= \frac{g(x_2) - g(x_1)}{x_2 - x_1}$ $= \frac{\left[(3)^2 + 3(3) - 2\right] - \left[(-2)^2 + 3(-2) - 2\right]}{3 - (-2)}$ $= \frac{16 - (-4)}{3 - (-2)}$ $= \frac{20}{5}$ $= 4$	✓ both values of/ beide waardes van *y* **A** ✓ **M** subst. into Ave. gradient Formula/*verv in gem grad vorm* **CA** ✓ m_{ave} value/ *waarde* **CA** **OR/*OF*** ✓ **M** subst. into Ave. gradient Formula/*verv. in gem grad vorm* **A** ✓ both values of/ *beide waardes van y* **CA** ✓ m_{ave} value/ *waarde* **CA** (3)
		[21]

QUESTION/*VRAAG* 7

7.1	$f(x) = x^3 - 2x^2 - 7x - 4$ $y = -4$ **OR/*OF*** $(0;-4)$	✓ *y*-intercept/ *afsnit* **A** (1)
7.2	$f(4) = (4)^3 - 2(4)^2 - 7(4) - 4$ $= 0$ $\therefore (x-4)$ is a factor of/ *is 'n faktor van* $f(x)$	✓ substitution/ *vervanging* **A** ✓ 0 **A** (2)
7.3	*x*-intercepts/*afsnitte*; $y = 0$ $(x-4)(x^2+2x+1) = 0$ $(x-4)(x+1)(x+1) = 0$ $\therefore\ x = -1$ *or* $x = 4$ **OR/*OF*** $(x+1)(x^2-3x-4) = 0$ $(x+1)(x-4)(x+1) = 0$ $\therefore x = -1$ or $x = 4$	✓ quadratic factor/ *kwdr. faktor* **A** ✓ factors/ *faktore* **CA** ✓ *x*-intercepts/ *afsnitte* **CA** **OR/*OF*** ✓ quadratic factor/ *kwdr faktor* **A** ✓ factors/ *faktore* **CA** ✓ *x*-intercepts/ *afsnitte* **CA** **AO**: **Full marks/*Volpunte*** (3)
7.4	$f'(x) = 3x^2 - 4x - 7 = 0$ $(3x-7)(x+1) = 0$ **OR/*OF*** $x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(3)(-7)}}{2(3)}$ $\therefore x = \frac{7}{3}$ or/*of* $x = -1$ $f\left(\frac{7}{3}\right) = \left(\frac{7}{3}\right)^3 - 2\left(\frac{7}{3}\right)^2 - 7\left(\frac{7}{3}\right) - 4 = -\frac{500}{27} \approx -18,52$ $\therefore \left(\frac{7}{3}; -\frac{500}{27}\right)$ and /*en* $(-1;0)$ **OR/*OF*** $(2,33; -18,52)$ and /*en* $(-1;0)$	✓derivative/*afgeleide* **A** ✓equating derivative to 0/ *stel afgeleide gelyk aan 0* **A** ✓factors/formula/*faktore* **CA** ✓both values of /*beide waardes van x* **CA** ✓ both values of /*beide waardes van y* **CA** (5)
7.5		✓ shape /*vorm* **A** ✓ *y*-intercept/ *afsnit* **CA** ✓ both *x*-intercepts/ *beide x-afsnitte* **CA** ✓ both turning points/ *beide draaipunte* **CA** (4)

7.6	$-1 < x < \frac{7}{3}$ **OR/*OF*** $-1 < x < 2{,}33$ **OR/*OF*** $x \in \left(-1\,;\frac{7}{3}\right)$ **OR/*OF*** $x \in (-1\,;2{,}33)$ **OR/*OF*** $x > -1$ and/en $x < \frac{7}{3}$ **OR/*OF*** $x > -1$ and/en $x < 2{,}33$	✓ crit. values/ *krit. waarde* **CA** ✓ correct notation / *korrek notasie* **A** **OR/*OF*** ✓ crit. values/ *krit. waarde* **CA** ✓ correct notation / *korrek notasie* **A** **OR/*OF*** ✓ crit. values/ *krit. waarde* **CA** ✓ correct notation / *korrek notasie* **A** (2) **[17]**

QUESTION/*VRAAG* 8

8.1	$V = l \times b \times h$ $4000 = x^2 h$ $\therefore h = \frac{4000}{x^2}$	✓ **SF** **A** (1)
8.2	Tot. Surface Area = length × breadth + 2 × length × height +2 × breadth × height *Tot. Buite oppervlakte = lengte × breedte + 2 × lengte × height +2 × breedte × height* $\text{Tot. Surface Area/ } Buite\ Oppervlakte = x^2 + 2xh + 2xh$ $= x^2 + 4x\left(\frac{4000}{x^2}\right)$ $= x^2 + \frac{16\,000}{x}$ **OR/*OF*** Tot. Surface Area = Area of base + (perimeter of base × height) *Tot. Buite Oppervlakte = oppervlakte van die basis + (omtrek van basis × hoogte)* $\text{Tot. Surface Area/ } Buite\ Oppervlakte = x^2 + 4xh$ $= x^2 + 4x\left(\frac{4000}{x^2}\right)$ $= x^2 + \frac{16\,000}{x}$	✓ **SF** **A** ✓ **S** . **CA** **OR/*OF*** ✓ **SF** **A** ✓ **S** . **CA** (2)
8.3	$\therefore Tot\ \text{Surface Area/ } Buite\ Oppervlakte = x^2 + \frac{16\,000}{x}$ $= x^2 + 16000x^{-1}$ $\frac{d(\text{Tot. Surface Area / } Buit. Oppervlakte)}{dx} = 2x - 16000x^{-2}$ $= 2x - \frac{16000}{x^2}$ $2x^3 - 16000 = 0$ $x^3 = 8000$ $x = 20\text{cm}$ $h = \frac{4000}{(20)^2} = 10$	✓ derivative/ *afgeleide* **A** ✓**S** **A** ✓ equating derivative to/ *stel afgeleide aan* 0 **A** ✓ value of/ *waarde van x* **CA** ✓ value of/*waarde van h* **CA** **NPU** (5) **[8]**

QUESTION/*VRAAG* 9

9.1.1	$\int x\left(x^2+6x\right)dx$ $=\int\left(x^3+6x^2\right)dx$ $=\frac{x^4}{4}+2x^3+\mathrm{C}$	✓ **S** **A** ✓ $\frac{x^4}{4}$ **CA** ✓ $2x^3$ **CA** ✓ C **A** (4)
9.1.2	$\int\left(3^x+\frac{1}{x}\right)dx$ $=\frac{3^x}{\ln 3}+\ln x+\mathrm{C}$	✓ $\frac{3^x}{\ln 3}$ **A** ✓ $\ln x+\mathrm{C}$ **A** (2)
9.2 #	$\mathrm{A}=\int_k^4 g(x)\,dx$ $=\int_k^4 3x^2\,dx$ $=x^3\Big]_k^4$ $=(4)^3-(k)^3$ $\therefore (4)^3-(k)^3=56$ $\therefore k^3=8$ $\therefore k=2$ **OR/*OF*** $\mathrm{A}=\int_0^4 g(x)\,dx$ $=\int_0^4 3x^2\,dx$ $=x^3\Big]_0^4$ $=(4)^3-(0)^3=64$ $\mathrm{A}=\int_0^2 g(x)\,dx$ $=x^3\Big]_0^2$ $=(2)^3-(0)^3=8$ $\therefore 64-8=56$ $\therefore k=2$ **OR/*OF***	✓ **M** Area notation using integrals/ *Area-notasie met gebruik van integrale* **A** ✓ x^3 **A** ✓✓ **SF** **CA** ✓ equating area to/ *stel oppervl gelyk aan* 56 **CA** ✓ **S** **CA** ✓value of / *waarde van k* **CA** **OR/*OF*** ✓ **M** Area notation using integrals/ *Area-notasie met gebruik van integrale* **A** ✓ x^3 **A** ✓✓ **SF** **CA** ✓ **S** **CA** ✓ **M** **CA** ✓value of / *waarde van k* **CA** **OR/*OF***

	Trial & Error Method/ *Probeer en Trefmetode* $A = \int_k^4 g(x)\,dx$ $= \int_k^4 3x^2\,dx$ $= x^3\Big]_k^4$ Let/*Laat* $k = 1$ $= x^3\Big]_1^4$ $= (4)^3 - (1)^3$ $= 63$ Let/*Laat* $k = 2$ $= x^3\Big]_2^4$ $= (4)^3 - (2)^3$ $= 56$ $\therefore k = 2$	✓Area notation using integrals/ *Area-notasie met gebruik van integrale* **M** ✓ x^3 **A** ✓ **M** **CA** ✓✓ **SF** **CA** ✓ **S** **CA** ✓value of / *waarde van k* **CA** (7) **[13]**

TOTAL/*TOTAAL*: 150