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*

2019

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 penaliseering vir Afronding***
NPU	**No Penalty for Units omitted /*Geen penaliseering vir Eenhede weggelaat***
S	**Simplification / *Vereenvoudiging***
F	**Correct/*Korrekte* formula**
SF	**Substitution in correct formula/ *Vervanging in korrekte formule***

Date approved/ Datum goedgekeur:	**EXTERNAL MODERATOR**	**INTERNAL MODERATORS**	
	MA HENDRICKS	**N TOM**	**NS MUTHIGE**
19 MAY 2019	**SIGNATURE**	**SIGNATURE**	**SIGNATURE**

These marking guidelines consist of 17 pages./
Hierdie nasienriglyne bestaan uit 17 bladsye

NOTE:
- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent accuracy method of marking must be applied as indicated..

LET WEL:
- *Indien 'n kandidaat 'n vraag TWEE keer beantwoord, sien slegs die EERSTE poging na.*
- *Volgehoue akkuraatheid metode van nasien moet deurgaans toegepas word soos aangedui.*

QUESTION/*VRAAG* 1

1.1.1	$6x-2x^2=0$ $2x(3-x)=0$ $\therefore x=0$ or/*of* $x=3$ **OR/OF** $6x-2x^2=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\frac{-6\pm\sqrt{(-6)^2-4(-2)(0)}}{2(-2)}$ $=\frac{-6\pm 6}{-4}$ $\therefore x=0$ or/of $x=3$	✓**M** factors/faktore/formula **A** ✓ $x=0$ **CA** ✓ $x=3$ **CA** **OR/OF** ✓**SF** **A** ✓ $x=0$ **CA** ✓ $x=3$ **CA** **AO: Full marks/*volpunte*** (3)
1.1.2	$x(2x+1)=5$ $2x^2+x-5=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $x=\frac{-1\pm\sqrt{1^2-4(2)(-5)}}{2(2)}$ $x=\frac{-1\pm\sqrt{41}}{4}$ $\therefore x\approx 1{,}35$ or/*of* $x\approx -1{,}85$	✓ standard form/ *Standaardvorm* **A** ✓ **SF** **CA** ✓ **S** **CA** ✓both *x*-values/*beide x-waardes* **CA** ✓ **R** **CA** **AO: Full marks/*volpunte*** (5)
1.1.3	$3x^2 \le 12$ **OR/OF** for critical values $3x^2-12\le 0$; $3x^2-12=0$ $3(x-2)(x+2)\le 0$; $3(x-2)(x+2)=0$ **critical values:** 2 **and** -2 *kritieke waardes: 2 en – 2* $\therefore -2\le x\le 2$ **OR/OF** $x\in[-2\,;2]$	✓standard form/*standaardvorm* **A** ✓ **M** factors/*faktore*/formula/*formule* **A** ✓both critical values/*beide kritieke waardes* **CA** ✓correct notation/*korrekte notasie* **CA** **AO: Full marks/*volpunte*** (4)

1.2	**NOT TO BE MARKED/ *MOET NIE GEMERK WORD NIE***	
1.3.1	$v=\frac{2\pi r}{t}$ $2\pi r = vt$ $\therefore r=\frac{vt}{2\pi}$ **OR/*OF*** $v=\frac{2\pi r}{t}$ $\frac{v}{\frac{2\pi}{t}}=\frac{\frac{2\pi r}{t}}{\frac{2\pi}{t}}$ $\therefore r=\frac{v}{\frac{2\pi}{t}}=\frac{vt}{2\pi}$	✓**M** multiplying by t/ *vermenigvuldiging met t* **A** ✓ **M** dividing by 2π / *deling deur* 2π **CA** **OR/*OF*** ✓**M** dividing by/*deel deur* $\frac{2\pi}{t}$ **A** ✓ *r* as the subject/*as onderwerp* **CA** **AO: Full marks/*volpunte*** (2)
1.3.2(a)	$t=1,94\times10^{-5}$ hours/*ure* **OR/*OF*** $t=1,94\times10^{-5}\times3600$ $=6,984\times10^{-2}$ sec/*sek*	✓ 1,94 ✓ 10^{-5} **A** **OR/*OF*** ✓ 6, 984 ✓ 10^{-2} **A** **NPR** (2)
1.3.2(b)	$r=\frac{vt}{2\pi}$ $r=\frac{91,116\times1,94\times10^{-5}}{2\pi}$ km **OR / *OF*** $r=\frac{91,116\times0,0000194}{2\pi}$ km $r\approx2,81\times10^{-4}$ km **OR/*OF*** $v=\frac{2\pi r}{t}$ $91,116=\frac{2\pi r}{1,94\times10^{-5}}$ $r\approx2,81\times10^{-4}$ km	✓ **SF** **CA from/vanaf Q 1.3.1 and/en Q 1.3.2 (a)** ✓ $r\approx2,81\times10^{-4}$ km **CA** **OR/*OF*** ✓ **SF** **CA from Q 1.3.1 and Q 1.3.2 (a)** ✓ $r\approx2,81\times10^{-4}$ km **CA** **NPR** **NPU** **AO: Full marks/*volpunte*** (2)
1.4	$10111_2=16+4+2+1$ $=23$	✓ **M** **A** ✓23 **A** **AO: Full marks/*volpunte*** (2)

[20 MARKS TO BE SCALED TO 26 MARKS AS PER TABLE PROVIDED/ 20 *PUNTE MOET OPGESKAAL WORD A 26 PUNTE, PER TABELVOORSIEN*]

QUESTION/*VRAAG* 2

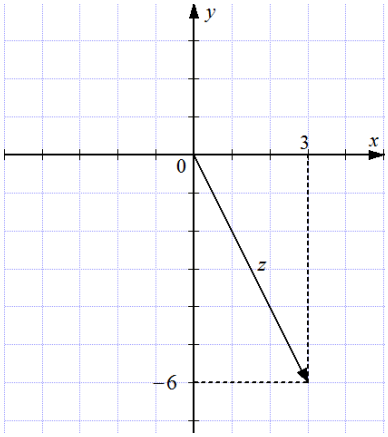
2.1.1	$2p+7\neq 0$ $p\neq -\frac{7}{2}$ **OR/*OF*** $p\in\mathbb{R}-\left\{-\frac{7}{2}\right\}$	✓ $p\neq -\frac{7}{2}$ **A** **OR/*OF*** ✓ $p\in\mathbb{R}-\left\{-\frac{7}{2}\right\}$ **AO: Full marks/*volpunte*** (1)
2.1.2	$p+3\geq 0$ $p\geq -3$ O**R/*OF*** $p\in[-3;\infty)$	✓ **M** **A** ✓ value of *p*/*waarde van p* **CA** only if inequality used/ slegs as ongelykheid gebruik word (2)
2.2.1	$kx^2+2=10x$ $kx^2-10x+2=0$ $\Delta=b^2-4ac$ $=(-10)^2-4(k)(2)$ $=100-8k$	✓ **M** standard form/*standaardvorm* **A** ✓ **SF** **CA** ✓ **S** in terms of *k/ in terme van k* **CA** (3)
2.2.2	For equal roots/*Vir gelyke wortels*: $\Delta=0$ $100-8k=0$ $k=\frac{25}{2}$	✓ **M** **CA from/*vanaf* Q/*V* 2.2.1** ✓ **S** value of *k*/*waarde van k* **CA** **AO: Full marks/*volpunte*** (2)

[8]

QUESTION/*VRAAG* 3

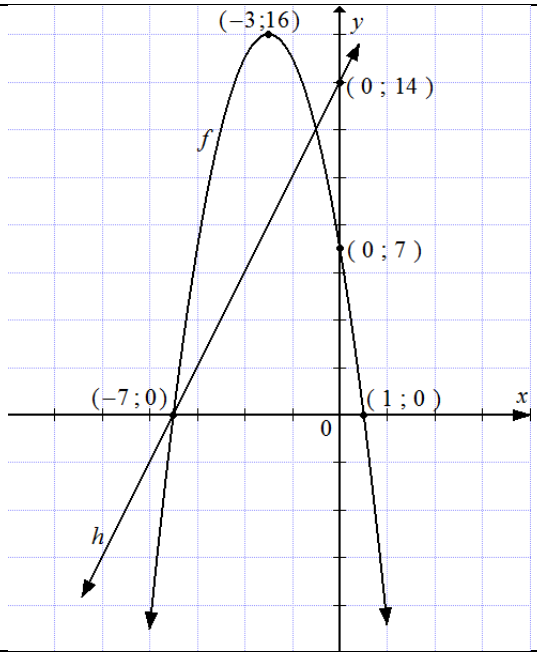
3.1.1	$3(2x)^0 = 3(1) = 3$	✓ **S** **A** (1)
3.1.2	$\log(-10)$ is undefined/*is ongedefinieerd*	✓undefined/ *ongedefinieerd* **A** **Accept/aanvaar:** Unanswerable, impossible , no value/geen anword, *onmoountlik. aeen waarde* (1)
3.1.3	$\frac{5^{2n+1} + 4\times5^{2n}}{25^n}$ $= \frac{5^{2n}\times5^1 + 4\times5^{2n}}{5^{2n}}$ **OR/OF** $= 5^{-2n}(5^{2n}\times5^1 + 4\times5^{2n})$ $= \frac{5^{2n}(5+4)}{5^{2n}}$ $= 5 + 4$ $= 9$ $= 9$ **OR/*OF*** $\frac{5^{2n+1} + 4\times5^{2n}}{25^n}$ $= \frac{5^{2n+1}}{5^{2n}} + \frac{4\times5^{2n}}{5^{2n}}$ $= 5+4$ $= 9$ **OR/*OF*** $\frac{5^{2n+1} + 4\times5^{2n}}{25^n}$ $= \frac{5\times25^n + 4\times25^n}{25^n}$ $= \frac{25^n(5+4)}{25^n}$ $= 9$ **OR/*OF*** $\frac{5^{2n+1} + 4\times5^{2n}}{25^n}$ $= \frac{5\cdot5^{2n} + 4\cdot5^{2n}}{5^{2n}}$ $= \frac{9\cdot5^{2n}}{5^{2n}}$ $= 9$	✓ **M** $25^n = 5^{2n}$ **A** ✓ **M** factorisation/ *faktorisering* **A** ✓ **S** **CA** **OR/*OF*** ✓ **M** $25^n = 5^{2n}$ **A** ✓ **M** division/deling **A** ✓ **S** **CA** **OR/*OF*** ✓ **M** $5^{2n} = 25^n$ **A** ✓ **M** factorisation/ *faktorisering* **A** ✓ **S** **CA** ✓ **M** $25^n = 5^{2n}$ **A** ✓ **M** adding like terms/ *optel van gelyksoortige terme* **A** ✓ **S** **CA** (3)

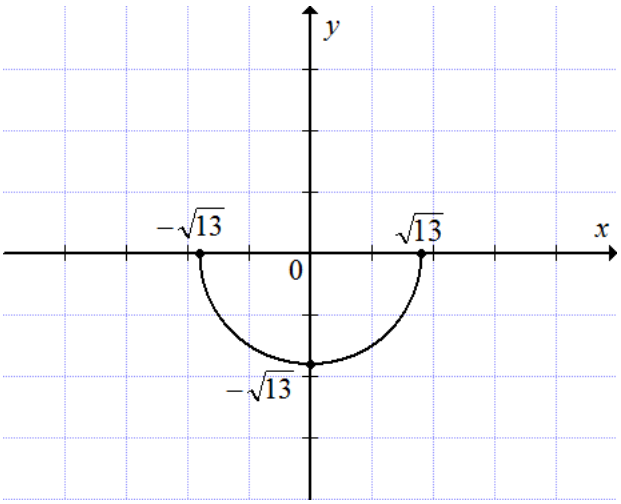
3.2	$\log_3(x+36) = \log_3 2x + \log 100$ $\log_3(x+36) - \log_3 2x = 2$ $\log_3\left(\frac{x+36}{2x}\right) = 2$ $\frac{x+36}{2x} = 3^2 = 9$ $18x = x + 36$ $17x = 36$ $\therefore x = \frac{36}{17}$ **OR/*OF*** $\log_3(x+36) = \log_3 2x + \log 100$ $\log_3(x+36) = \log_3 2x + 2$ $\log_3(x+36) - \log_3 2x + \log_3 9 = 0$ $\log_3\left(\frac{x+36}{2x\times 9}\right) = 0$ $\log_3\left(\frac{x+36}{18x}\right) = 0$ $\frac{x+36}{18x} = 3^0$ $18x = x + 36$ $17x = 36$ $\therefore x = \frac{36}{17}$ **OR/*OF*** $\log_3(x+36) = \log_3 2x + \log 100$ $\log_3(x+36) = \log_3 2x + 2\log_3 3$ $\log_3(x+36) = \log_3 2x - \log_3 9$ $\log_3(x+36) = \log_3 18x$ $x + 36 = 18x$ $17x = 36$ $\therefore x = \frac{36}{17}$	✓ 2 **A** ✓ **M** log property/ *log-eienskap* **A** ✓ **M** exp. notation/ *eksp. Notasie* **CA** ✓ **S** **CA** ✓ **S** value of *x*/*waarde van x* **CA** **OR/*OF*** ✓ 2 **A** ✓ **M** log property/ *log-eienskap* **A** ✓ **M** exp. notation/ *eksp. Notasie* **CA** ✓ **S** **CA** ✓ **S** value of *x*/*waarde van x* **CA** **OR/*OF*** ✓ 2 **A** ✓ **M** log property/ *log-eienskap* **A** ✓ **M** log property/ *log-eienskap* **CA** ✓ **S** **CA** ✓ **S** value of *x*/*waarde van x* **CA** (5)

3.3	$z = 3 - 6i$ $x = 3$ and/*en* $y = -6$ **OR/*OF*** $(3\,;-6)$  	✓ **M** real component/reele komponent **A** ✓ **M** complex component/ komplekse komponent **A** ✓ correct plotting of point/korrekte plot van punt (3; - 6) **CA** (3)
3.4	$p + qi = \dfrac{3-4i}{2+i}$ $= \dfrac{3-4i}{2+i} \times \dfrac{2-i}{2-i}$ $= \dfrac{6-11i+4i^2}{4-i^2}$ $= \dfrac{6-11i+4(-1)}{4-(-1)}$ $= \dfrac{2}{5} - \dfrac{11}{5}i$ $\therefore p = \dfrac{2}{5}$ and $q = -\dfrac{11}{5}$ **OR/*OF*** $p + qi = \dfrac{3-4i}{2+i}$ $(p + qi)(2 + i) = 3 - 4i$ $2p + pi + 2qi + qi^2 = 3 - 4i$ $2p - q + i(p + 2q) = 3 - 4i$ $2p - q = 3$ (1) $p + 2q = -4$ (2) $p = \dfrac{2}{5}$ $q = 2\left(\dfrac{2}{5}\right) - 3 = -\dfrac{11}{5}$	✓**M** multiplying by/ *vermenigvuldiging deur* $\dfrac{2-i}{2-i}$ **A** ✓ **S** **CA** ✓ **S** $i^2 = -1$ **A** ✓ **S** value of *p*/*waarde van p* **CA** ✓ **S** value of *q*/*waarde van q* **CA** **OR/*OF*** ✓**M** product/produk **A** ✓ **S** **CA** ✓ Eqs./*Vgl* (1) and/*en* (2) **CA** ✓ **S** value of *p*/*waarde van p* **CA** ✓ **S** value of *q*/*waarde van q* **CA** **AO: Full marks/*volpunte*** (5) **[18]**

QUESTION / *VRAAG* 4

4.1.1	(0 ; 7) **OR/*OF*** $y = 7$	✓ **M** *y*-intercept/*-afsnit* **A** (1)
4.1.2	$-x^2-6x+7=0$ $x^2+6x-7=0$ $(x+7)(x-1)=0$ $x=-7$ or $x=1$ **OR/*OF*** $-x^2-6x+7=0$ $x=\frac{-(-6)\pm\sqrt{(-6)^2-4(-1)(7)}}{2(-1)}$ $x=-7$ or $x=1$	✓ **M** factors/*faktore* **A** ✓**S** *x* value/ *x-waarde* **CA** ✓**S** *x* value/ *x-waarde* **CA** **OR/*OF*** ✓ **SF** formula/*fomule* **A** ✓**S** *x* value/ *x-waarde* **A** ✓**S** *x* value/ *x-waarde* **A** **Accept/aanvaar** $(-7;0)$ and $(1\ ;\ 0)$ **AO: Full marks/*volpunte*** (3)
4.1.3	$f(x)=-x^2-6x+7$ $x=-\frac{b}{2a}=-\frac{(-6)}{2(-1)}=-3$ $y=-(-3)^2-6(-3)+7=16$ **OR/OF** $y=\frac{4(-1)(7)-(-6)^2}{4(-1)}=16$ TP/DP$(-3;16)$ **OR/*OF*** $f(x)=-x^2-6x+7$ $x=\frac{-7+1}{2}=-3$ $y=-(-3)^2-6(-3)+7=16$ TP / DP$(-3;16)$ **OR/*OF*** $f(x)=-x^2-6x+7$ $f'(x)=-2x-6$ $0=-2x-6$ $\therefore x=-3$ $y=-(-3)^2-6(-3)+7$ $\therefore y=16$ TP/DP$(-3;16)$	✓ **SF** **A** ✓ **S** *x* value/*x-waarde* **CA** ✓ *y* value/*y-waarde* **CA** **OR/*OF*** ✓ **M** **A** ✓ **S** *x* value/*x-waarde* **CA** ✓ **S** *y* value/*y-waarde* **CA** **OR/*OF*** ✓ **M** $f'(x)=0$ **A** ✓ **S** *x* value/*x-waarde* **CA** ✓ *y* value/*y-waarde* **CA** **AO: Full marks/*volpunte*** (3)

4.1.4		✓ correct intercepts on both axes/ *korrekte afsnitte op beide asse* **CA** ✓correct turning point/*korrekte draaipunt* **CA** ✓shape/*vorm* **A** (3)
4.1.5	$h(x)=2x+14$ *y*-intercept/*y-afsnit*: $y = 14$ x - intercepts/-afsnitte: $2x+14=0$ $\therefore x=-7$	✓ correct intercepts on both axes/ *korrekte afsnitte op beide asse* **A** ✓shape/*vorm* (diagram in Q/*V* 4.1.4) **A** (2)
4.1.6	$-x^2-6x+7=2x+14$ $x^2+8x+7=0$ $(x+7)(x+1)=0$ $x=-7$ or $x=-1$ $\therefore -7\le x\le -1$ **OR/OF** $x\in[-7;-1]$ **OR/*OF*** $-x^2-6x+7\ge 2x+14$ $x^2+6x-7+2x+14\le 0$ $x^2+8x+7\le 0$ $(x+7)(x+1)\le 0$ $\therefore -7\le x\le -1$ **OR / OF** $x\in[-7;-1]$	✓ **M** equating $f(x)$ and $h(x)$/*stel* $f(x)$ *en* $h(x)$ *gelyk* **A** ✓ **S** standard form/*standaardvorm* **CA** ✓ **M** factors/*faktore*/formula **CA** ✓ **S** both critical values/*beide kritieke waardes* **CA** ✓ correct notation/*korrekte notasie* **CA** **OR/*OF*** ✓ **M** setting inequality/*opstel v. ongelyk.* **A** ✓ **S** standard form/*standaardvorm* **CA** ✓ **M** factors/*faktore*/formula **CA** ✓ **S** both critical values/*beide kritieke waardes* **CA** ✓ correct notation/*korrekte notasie* **CA** **AO: Full marks/*volpunte*** (5)

4.2.1	$q = 1$	✓1 **A** (1)
4.2.2	$f(x) = \frac{4}{x} + 1$ $0 = \frac{4}{x} + 1$ $-1 = \frac{4}{x}$ $x = -4$ $\therefore$ T$(-4;0)$	✓ **M** $0 = \frac{4}{x} + 1$ **A** ✓ **S** coordinates of /*koordinate van* T **CA** **AO: Full marks/*volpunte*** (2)
4.2.3	$x \neq 0$ **OR/*OF*** $x \in (-\infty;0) \cup (0;\infty)$ **OR/*OF*** $x \in \mathrm{R} - \{0\}$ **OR/*OF*** $x \in \mathrm{R}; x \neq 0$	✓correct domain/*korrekte gebied (definisieversameling)* **A** (1)
4.2.4	$y > 1$ **OR/*OF*** $y \in (1;\infty)$	✓correct range/*korrekte terrein (waardeversameling)* **A** (1)
4.3		✓ both *x*-intercepts/*beide x-afsnitte* **A** ✓ *y*-intercept/*y-afsnit* **A** ✓correct shape/*korrekte vorm* **A** (3) **Accept/aanvaar** $3,61$

[25]

QUESTION/*VRAAG* 5

5.1	$A=P(1-i)^n$ $90=159(1-8\%)^n$ $\frac{90}{159}=(0,92)^n$ $n=\log_{0,92}\left(\frac{90}{159}\right)$ $\therefore n\approx 6,83$ min.	✓ **F** ✓**SF**substitution/*vervanging* **A** ✓ **M** applying log property /*pas log-eienskap toe* **A** ✓ **S** value of /*waarde van n* **CA** **NPR** (4)
5.2.1	R30 000 **OR/*OF*** 30 thousand rand/ 30 *duisend rand*	✓ correct initial amount/*korrekte aanvanklike bedrag* **A** (1)
5.2.2	$A=P(1+i)^n$ $=30\,000\,(1+9,5\%)^3$ $\approx$ R 39 387,97	✓ **F** **A** ✓ **SF** **CA** ✓exact value/*presiese waarde* **CA** (3)
5.2.3	12,5% p.a. compounded quarterly/*p.j. kwartaalliks saamgestel*: $A=P(1+i)^n$ $=39\,387,97\left(1+\frac{12,5\%}{4}\right)^{4\times 4}$ $\approx$ R 64 444,67 With interest at 9,5% p.a $A=P(1+i)^n$ $=$ R30 000$(1+9,5\%)^7$ **OR/OF** R 39 387,97$(1+9,5\%)^4$ $\approx$ R 56 626,55 The additional amount the investor will receive/*Die addisionele bedrag wat die belegger sal ontvang*: R64 444,67 – R56 626,55 = R7 818,12	✓value of P from Q 5.2.2/ *waarde van P van V 5.2.2* **CA** ✓ **SF** **A** ✓ value of A/*waarde van A* **CA** ✓ **SF** **A** ✓ value of A/*waarde van A* **CA** ✓**S** difference/*verskil* **CA** (6)

[14]

QUESTION/*VRAAG* 6

6.1	$f(x)=1-x$ $f'(x)=\lim\limits_{h\to 0}\frac{f(x+h)-f(x)}{h}$ $=\lim\limits_{h\to 0}\frac{[1-(x+h)]-(1-x)}{h}$ $=\lim\limits_{h\to 0}\frac{1-x-h-1+x}{h}$ $=\lim\limits_{h\to 0}\frac{-h}{h}$ $=\lim\limits_{h\to 0}(-1)$ $\therefore f'(x)=-1$	✓ **M** using the definition/ *gebruik die definisie* **A** ✓ **SF** **A** ✓ **S** **CA** ✓ **S** **CA** ✓ -1 **CA** **AO: only 1 mark/sleg 1 punt** **Penalty of 1 mark for incorrect notation/*Penaliseer een punt indien notasie foutief is.*** (5)
No penalty for notation in the remaining question/*Geen penalisering vir notasie in volgende vraag*.		
6.2.1	$\frac{d}{dx}(2x^{-3}-9x+4\pi)$ $=-6x^{-4}-9$	✓ **M** $-6x^{-4}$ **A** ✓ **M** -9 **A** (2)
6.2.2	$\mathbf{D}_x\left[\frac{x^3-27}{x-3}\right]$ $=\mathbf{D}_x\left[\frac{(x-3)(x^2+3x+9)}{x-3}\right]$ $=\mathbf{D}_x(x^2+3x+9)$ $=2x+3$	✓ **M** $(x-3)(x^2+3x+9)$ **A** ✓ **S** only if factorized or long division/ *slegs as faktorisering of langdeling* **CA** ✓ $2x$ **CA** ✓ 3 **CA** (4)
6.2.3	$xy=7\sqrt{x}$ $y=\frac{7x^{\frac{1}{2}}}{x}$ $=7x^{-\frac{1}{2}}$ $\therefore \frac{dy}{dx}=-\frac{7}{2}x^{-\frac{3}{2}}$	✓**M** exponential form/ *eksponensiële vorm* **A** ✓ **M** division/*deling* **A** ✓ $-\frac{7}{2}x^{-\frac{3}{2}}$ only if divided by x/ *slegs as deur x gedeel word* **CA** (3)

6.3.1	$g(x) = 1 - x^3$ $g(-1) = 1 - (-1)^3$ $= 2$ $g(2) = 1 - (2)^3$ $= -7$ Average/gemid.gradient $= \frac{g(x_2) - g(x_1)}{x_2 - x_1}$ $= \frac{-7-2}{2-(-1)}$ $= -3$	✓**M** 2 **A** ✓**M** -7 **A** ✓ **SF** **CA** ✓ **S** **CA** (4)
6.3.2	$g(x) = 1 - x^3$ $2 = 1 - x^3$ $x^3 = 1$ $\therefore x = -1$ $g'(x) = -3x^2$ $m = -3(-1)^2 = -3$ $y - y_1 = m(x - 1)$ **OR/OF** $y = mx + c$ $y - 2 = -3(x - (-1))$ $2 = -3(-1) + c$ $c = -1$ $y = -3x - 1$	✓**M** substituting/*vervang* $y = 2$ **A** ✓ value of /*waarde van x* **CA** ✓**M** derivative/*afgeleide* **A** ✓value of/*waarde van m* **CA** ✓ **SF** **CA** ✓equation/*vergelyking* **CA** (6) **Accept any form of eq./aanvaar enige vorm van die vgl.**
		[24]

QUESTION/*VRAAG* 7

7.1	$f(x) = x^3 - x^2 - 8x + 12$ $f(0) = (0)^3 - (0)^2 - 8(0) + 12$ $= 12$ $\therefore A(0;12)$ $\therefore OA = 12$ units/eenhede	✓ **M** substitution/*vervanging* **A** ✓ length of OA/*lengte van OA* **A** **AO: Full marks/*volpunte*** (2)
7.2	$f(x) = x^3 - x^2 - 8x + 12$ $f(2) = (2)^3 - (2)^2 - 8(2) + 12$ $f(2) = 0$ $\therefore x - 2$ is a factor of f / *faktor van* f	✓ **S** **A** ✓ 0 **A** **Accept long division/aanvaar langdeling** (2)
7.3	$f(-3) = (-3)^3 - (-3)^2 - 8(-3) + 12$ = 0 $\therefore f(x) = (x+3)(x-2)(x-2)$ **OR/*OF*** $f(x) = (x-2)(x-2)(x+3)$ **OR/*OF*** $x - 2 \overline{)\, x^3 - x^2 - 8x + 12}$ $\quad x^2 + x - 6$ $f(x) = (x-2)(x^2 + x - 6)$ $\therefore f(x) = (x-2)(x+3)(x-2)$ **OR/*OF*** $f(x) = (x-2)(x^2 + bx - 6)$ $-2x^2 + bx^2 = -x^2$ $bx^2 = x^2$ $\therefore b = 1$ $f(x) = (x-2)(x^2 + x - 6)$ $\therefore f(x) = (x-2)(x+3)(x-2)$	✓ **M** $f(-3)$ **A** ✓ recognising TP as a repeated factor/*herken TP as 'n herhaalde factor* $(x-2)(x-2)$ **A** ✓ factors of /*faktore van* $f(x)$ **A** **OR/*OF*** ✓✓**M** dual factors/*dubbel faktore* **A** ✓ factors of /*faktore van f*(*x*) **A** **OR/*OF*** ✓ **M** long division, inspection, substitution/l*angdeling, inspeksie, vervanging* **A** ✓ $x^2 + x - 6$ **A** ✓ factors of /*faktore van f*(*x*) **A** **OR/*OF*** ✓ **M** finding quadratic factor/*kwadratiese faktor te vind* **A** ✓quadratic term/*kwadratiese term* **A** ✓factors of /*faktore van* $f(x)$ **A** (3)

7.4	$T(-3;0)$ $P(2;0)$	✓ $T(-3;0)$ **CA only if neg./slegs as neg.** ✓ $P(2;0)$ **A** (2)
7.5	$f(x)=x^3-x^2-8x+12$ $f'(x)=3x^2-2x-8$ $f'(x)=0$ $3x^2-2x-8=0$ $(3x+4)(x-2)=0$ $\therefore x=-\frac{4}{3}=-1\frac{1}{3}$ or $x=2$ $f\left(-\frac{4}{3}\right)=\left(-\frac{4}{3}\right)^3-\left(-\frac{4}{3}\right)^2-8\left(-\frac{4}{3}\right)+12$ $=\frac{500}{27}=18\frac{14}{27}$ $\therefore R\left(-1\frac{1}{3};18\frac{14}{27}\right)$ **OR/OF** $R\left(-1,33;18,52\right)$	✓**M** derivative/*afgeleide* **A** ✓equating derivative to 0/*stel afgeleide gelyk aan 0* **A** ✓factors/*faktore* **CA** ✓both values of *x*/*beide waardes van x* **CA** ✓ value of *y*/*beide waardes van y* **CA** (5)
7.6	$x\in\left(-1\frac{1}{3};2\right)$ **OR/*OF*** $-1\frac{1}{3}<x<2$	✓ both end points/*beide eindpunte* **CA** ✓ notation/*notasie* **A** **OR/*OF*** ✓ both end points/*beide eindpunte* **CA** ✓ notation/*notasie* **A** (2)

[16]

QUESTION/*VRAAG* 8

	NPU	
8.1	$s(t) = 7{,}5t^3 - 20t^2 + 27$ $= 7{,}5(0)^3 - 20(0)^2 + 27\text{ m}$ $= 27\text{ m}$	✓ initial displacement/ *Aanvanklike verplasing* **A** (1)
8.2	$s'(t) = 22,5t^2 - 40t$ $s'(3) = 22{,}5(3)^2 - 40(3)\text{ m/s}$ $= 82{,}5\text{ m/s}$	✓ derivative/*afgeleide* **A** ✓ substitution/*vervanging* **CA** ✓ rate of change/ *veranderingstempo* **CA** (3)
8.3	$s'(t) = 0$ $s'(t) = 22,5t^2 - 40t = 0$ $t(22{,}5t - 40) = 0$ $t = 0\ or\ t = 1{,}78$ $\therefore t \approx 1{,}78\text{sec/}sek$	✓ **M** derivative equal to 0/ *afgeleide gelyk aan 0* **CA from Q/V 8.2** ✓ **M** factors/*faktore* **CA** ✓ both values of *t*/*beide waardes van t* **CA** ✓ correct value of/ *korrekte waarde van t* **CA** **NPR** (4)

[8]

QUESTION /VRAAG 9

9.1.1	$\int(\pi x)\,dx$ $= \frac{\pi}{2}x^2 + C$	✓ **M** $\frac{\pi}{2}x^2$ **A** ✓ C **A** (2)
9.1.2	$\int\left(x^{-1} - \sqrt{x} - 11\right)dx$ $\int\left(\frac{1}{x} - x^{\frac{1}{2}} - 11\right)dx$ $= \ln x - \frac{x^{\frac{3}{2}}}{\frac{3}{2}} - 11x + C$ $= \ln x - \frac{2x^{\frac{3}{2}}}{3} - 11x + C$	✓ **M** power form/*magvorm vorm* **A** ✓ $\ln x$ **CA** ✓ $-\frac{x^{\frac{3}{2}}}{\frac{3}{2}}$ **CA** ✓ $-11x + C$ **A** (4)
9.2	$g(x) = x^3$ $A = \int_1^a x^3\,dx$ $A = \left[\frac{x^4}{4}\right]_1^a$ $3,75 = \left(\frac{(a)^4}{4}\right) - \left(\frac{1^4}{4}\right)$ $3,75 = \frac{a^4}{4} - \frac{1}{4}$ $15 = a^4 - 1$ $a^4 = 16$ $a = \pm 2$ $\therefore a = 2$	✓ **M** Area notation using integrals/ Area-notasie deur gebruik van *integraal notasie* **A** ✓ $\left[\frac{x^4}{4}\right]_1^a$ **A** ✓ substitution/*vervanging* **CA** ✓ $a^4 = 16$ **CA** ✓ positive value of / *positiewe waarde van* a **CA** (5)

[11]

TOTAL/*TOTAAL*: 150