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

TECHNICAL MATHEMATICS P1/TEGNIESE WISKUNDE V1

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 Penaliserings vir Afronding
NPU	No Penalty for Units omitted/Geen Penaliseering vir Eenhede Weggelaat
S	Simplification/Vereenvoudiging
SF	Substitution in Correct Formula/Vervanging in Korrekte Formule
AO	Answer only/Slegs antwoord

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

QUESTION/VRAAG 1			
1.1.1	$(3-x)(x+1)=0$ $x=3$ or / of $x=1$ OR/OF $x^2-2x-3=0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-3)}}{2(1)}$ $x=3$ or / of $x=-1$	$\checkmark x=3$ $\checkmark x=-1$ OR/OF $\checkmark x=3$ $\checkmark x=-1$	A A A A (2)
1.1.2	$2x^2 = 3x + 7$ $2x^2 - 3x - 7 = 0$ OR/ OF $-2x^2 + 3x + 7 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-3) \pm \sqrt{(-3)^2 - 4(2)(-7)}}{2(2)} = \frac{3 \pm \sqrt{65}}{4}$ $x \approx 2,77$ or / of $x \approx -1,27$	$\checkmark$ standard form/ <i>standaardvorm</i> $\checkmark$ SF $\checkmark$ positive x value/ <i>postiewe waarde</i> $\checkmark$ negative x value/ <i>negatiewe waarde</i> AO: Full marks/Volpunte NPR	A CA CA CA (4)

1.1.3	$x(x - 5) \leq 0$ Critical values/ kritiese waardes: 0 and/en 5 $\therefore 0 \leq x \leq 5$ OR/OF $x \in [0;5]$ OR/OF $x \geq 0$ and/en $x \leq 5$	✓ both critical values/ <i>beide kritiese waardes</i> A ✓ notation/notasie A (2)
1.2	$y + x = 3$ and / en $x^2 + y^2 = 89$ $y = 3 - x$ $x^2 + (3 - x)^2 = 89$ $x^2 + 9 - 6x + x^2 - 89 = 0$ $2x^2 - 6x - 80 = 0$ $x^2 - 3x - 40 = 0$ $(x - 8)(x + 5) = 0$ OR / OF $x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-40)}}{2(1)}$ $\therefore x = 8$ or / of $x = -5$ $\therefore y = 3 - 8 = -5$ or / of $y = 3 - (-5) = 8$ OR/OF $y + x = 3$ and / en $x^2 + y^2 = 89$ $x = 3 - y$ $(3 - y)^2 + y^2 = 89$ $9 - 6y + y^2 + y^2 - 89 = 0$ $2y^2 - 6y - 80 = 0$ $y^2 - 3y - 40 = 0$ $(y - 8)(y + 5) = 0$ OR / OF $y = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(1)(-40)}}{2(1)}$ $\therefore y = 8$ or / of $y = -5$ $\therefore x = 3 - 8 = -5$ or / of $x = 3 - (-5) = 8$	✓ y subject of formula/ <i>onderwerp van formule</i> A ✓ SF CA ✓ correct standard form/ <i>korrekte standaardvorm</i> CA ✓ factors/formula/ <i>faktore/formule</i> CA ✓ x-values/-waardes CA ✓ y-values/-waardes CA OR/OF ✓ x subject of formula/ <i>onderwerp van formule</i> A ✓ substitution/ <i>vervanging</i> CA ✓ correct standard form/ <i>korrekte standaardvorm</i> CA ✓ factors/formula CA ✓ y-values/-waarde CA ✓ x-values/-waardes CA (6)

1.3.1	$F = \frac{K Q_1 Q_2}{r^2}$ $F \cdot r^2 = K Q_1 Q_2$ $r^2 = \frac{K Q_1 Q_2}{F}$ $r = \sqrt{\frac{K Q_1 Q_2}{F}}$	✓ transposing/ oordra r^2 A ✓ r subject/ onderwerp CA AO: Full marks /Volpunte (2)
1.3.2	$r = \sqrt{\frac{K Q_1 Q_2}{F}}$ $r = \sqrt{\frac{(9 \times 10^9)(0,5 \times 10^{-6})(0,2 \times 10^{-6})}{2,25 \times 10^{-4}}}$ $r = 2 \text{ m}$ OR/OF $F = \frac{K Q_1 Q_2}{r^2}$ $2,25 \times 10^{-4} = \frac{(9 \times 10^9)(0,5 \times 10^{-6})(0,2 \times 10^{-6})}{r^2}$ $r = \sqrt{\frac{(9 \times 10^9)(0,5 \times 10^{-6})(0,2 \times 10^{-6})}{2,25 \times 10^{-4}}}$ $r = 2 \text{ m}$	✓ SF CA ✓ value of/waarde van r CA OR/OF ✓ SF A ✓ value of/waarde van r CA AO: Full marks/ Volpunte NPU (2)
1.4	$\begin{array}{r} 1101_2 + 111_2 \\ 1101_2 \\ + 111_2 \\ \hline 10100_2 \end{array}$ OR/OF $13 + 7 = 20$ $20 = 10100_2$	✓✓ 10100_2 A OR/OF ✓ 20 A ✓ 10100_2 CA AO: Full marks/ Volpunte (2)

[20]

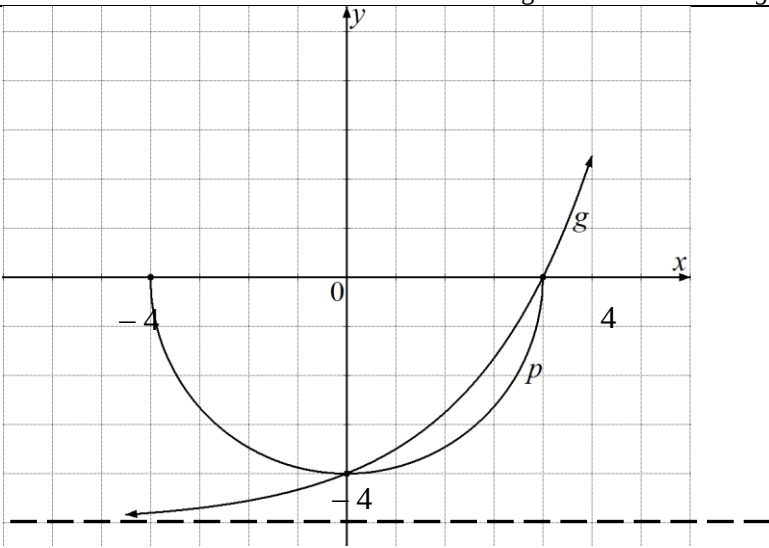
QUESTION/VRAAG 2		
2.1	$x = -3$ or/of $x = 0$ OR/OF $\Delta = 9$ Roots are rational/Wortels is rasionaal	✓ roots or discriminant/ wortels of diskriminant A ✓ rational/rasionaal A (2)
2.2	$x^2 + px - 2p^2 = 0$ $\Delta = b^2 - 4ac$ $= (p)^2 - 4(1)(-2p^2)$ $= p^2 + 8p^2$ $= 9p^2$ $\therefore$ Roots are rational/Wortels is rasionaal	✓ F A ✓ SF A ✓ S CA ✓ perfect square/ Volkome vierkant CA (4) [6]

QUESTION/VRAAG 3			
3.1.1	$\sqrt{16a^6}$ $= \sqrt{(4^2) \cdot (a^6)}$ OR /OF $(2^4 a^6)^{\frac{1}{2}}$ $= 4a^3$	$\checkmark 4$ $\checkmark a^3$	A A (2)
3.1.2	$\sqrt{\log_2 32 + \log 100 + 9}$ $= \sqrt{5\log_2 2 + \log 100 + 9}$ $= \sqrt{5 + 2 + 9}$ $= 4$	$\checkmark 5\log_2 2$ $\checkmark 2$ $\checkmark S$ AO: 0 marks/punte	A A CA (3)
3.1.3	$(4\sqrt{5} + \sqrt{2})(\sqrt{2} - 4\sqrt{5})$ $= 4\sqrt{10} - 80 + 2 - 4\sqrt{10}$ $= -78$ OR/OF $= -(4\sqrt{5} - \sqrt{2})(4\sqrt{5} + \sqrt{2})$ $= -80 + 2$ $= -78$	$\checkmark$ product/produk $\checkmark S$ OR/OF $\checkmark$ product/produk $\checkmark S$ AO: 0 marks/punte	A CA A CA (2)
3.2 #	$\log_3 x = 3 - \log_3(x+6)$ $\log_3 x + \log_3(x+6) = 3$ $\log_3(x^2 + 6x) = 3$ $x^2 + 6x = 3^3$ OR/OF $\log_3(x^2 + 6x) = 3\log_3 3$ $x^2 + 6x = 27$ $x^2 + 6x - 27 = 0$ $(x+9)(x-3) = 0$ $x \neq -9$ or / of $x = 3$ OR/OF $\log_3 x = 3 - \log_3(x+6)$ $\log_3 x = 3\log_3 3 - \log_3(x+6)$ $\log_3 x = \log_3 27 - \log_3(x+6)$ $\log_3 x = \log_3 \frac{27}{(x+6)}$ $x = \frac{27}{x+6}$ $x^2 + 6x - 27 = 0$ $(x+9)(x-3) = 0$ $x \neq -9$ or / of $x = 3$	$\checkmark$ log property/log-eienskap $\checkmark$ exponential form/ eksponensiële vorm $\checkmark$ standard form/ standaardvorm $\checkmark$ factors/formula/faktore/formule $\checkmark$ value of/waarde van x $\checkmark$ validity/geldigheid OR/OF $\checkmark$ log property/log-eienskap $\checkmark$ log property/log-eienskap $\checkmark$ standard form/ standaardvorm $\checkmark$ factors/formula/ faktore $\checkmark$ value of/ waarde van x $\checkmark$ restriction/ beperking	A A CA CA CA A A CA CA CA CA (6)

3.3.1	$z = 2 \left(\frac{1}{2} + 3i \right) - 7i = 1 + 6i - 7i$ $= 1 - 1i$	✓ substitution/vervanging w ✓ S AO: Full marks/ Volpunte (2)	A A
3.3.2 #	$ z = r = \sqrt{x^2 + y^2} = \sqrt{(1)^2 + (-1)^2} = \sqrt{2}$ $\tan \theta = -\frac{1}{1} = -1$ ref. angle / verw. hoek = 45° $\theta = 360^\circ - 45^\circ = 315^\circ$ $\therefore z = \sqrt{2} \text{ cis } 315^\circ$	✓ modulus CA from/vanaf Q/V 3.3.1 ✓ value of/waarde van $\tan \theta$ CA from/vanaf Q/V 3.3.1 ✓ ref angle/verw. hoek CA ✓ angle in the correct quadrant/ hoek in die regte kwadrant CA ✓ polar form/polere vorm CA AO: Full marks/ Volpunte (5)	CA CA CA
3.4	$a + b + i a - b i = 5 - 3i$ $a + b + (a - b)i = 5 - 3i$ $a + b = 5 \dots\dots\dots 1$ $a - b = -3 \dots\dots\dots 2$ Equat./ vergelyk. 1 + Equat./ vergelyk. 2 $a + b = 5$ $\underline{a - b = -3}$ $2a = 2$ $\therefore a = 1$ $\therefore b = 4$ $a = 5 - b$ $a - b = -3$ $(5 - b) - b = -3$ $-2b = -8$ $\therefore b = 4$ $a = 5 - 4$ $\therefore a = 1$ OR/ $a + b - 5 = bi - ai - 3i$ $a + b - 5 = 0$ $-a + b - 3 = 0$ $(1) - (2): 2b - 8 = 0$ $2b = 8$ $b = 4$ $a + 4 - 5 = 0$ $a = 1$	✓ equation/ vergelyking A ✓ equation/ vergelyking CA ✓ value of/waarde van a CA ✓ value of/waarde van b CA OR/OF ✓ equation/ vergelyking A ✓ equation/ vergelyking CA ✓ value of/waarde van b CA ✓ value of/waarde van a CA (4) [24]	CA CA CA CA CA CA

QUESTION/VRAAG 4			
4.1.1	$x \in \square \quad x \neq 0 \quad \text{OR/OF} \quad x \in (-\infty; 0) \cup (0; \infty)$ OR/OF $-\infty < x < 0 \quad \cup \quad 0 < x < \infty$	✓ domain/gebied	A (1)
4.1.2	P(-4; 0)	✓ coordinates of/ koördinate van P	A (1)
4.1.3(a) #	P(-4; 0), S(2; 0) and/ en U(1; 10) $y = a(x - x_1)(x - x_2)$ $y = a(x + 4)(x - 2)$ $10 = a(1 + 4)(1 - 2)$ $\therefore a = -2$ $\therefore f(x) = -2(x + 4)(x - 2) \text{ OR/OF } f(x) = -2x^2 - 4x + 16$ OR/OF $y = a(x + 1)^2 + q$ $10 = a(1 + 1)^2 + q$ $10 = 4a + q$ $0 = a(2 + 1)^2 + q$ $q = -9a$ $\therefore 10 = 4a - 9a$ $\therefore a = -2$ $\therefore q = -9(-2) = 18$ $\therefore f(x) = -2(x + 1)^2 + 18$	✓ subst. roots/verv wortels A ✓ subst/verv U CA ✓ $a = -2$ CA ✓ eq. of/verg van f CA OR/OF ✓ subt./verv (1; 10) A ✓ subt./verv (2; 0) A ✓ values of a and q / waardes van a en q CA ✓ eq. of/verg van f CA (4)	
4.1.3(b)	$h(x) = \frac{k}{x} + q$ $= \frac{k}{x} + 9$ $10 = \frac{k}{1} + 9$ $\therefore k = 1$ $\therefore h(x) = \frac{1}{x} + 9$	✓ SF (asymptote/assimptoot)) A ✓ subst./verv (1; 10) A ✓ eq. of/verg. van h CA (3)	

4.1.4	At / by R: $y = -2(-1)^2 - 4(-1) + 16 = 18$ At / by V: $y = \frac{1}{(-1)} + 9 = 8$ $\therefore RV = 18 - 8 = 10$ units/ eenhede OR/OF $RV = f(x) - h(x)$ $= -2(-1)^2 - 4(-1) + 16 - \left(\frac{1}{(-1)} + 9 \right)$ $= 18 - 8$ $= 10$	✓ y value/waarde CA from Q/vanaf V 4.1.3(a) ✓ y value/waarde CA from Q/ vanaf V 4.1.3(b) ✓ length/ lengte CA OR/OF ✓ f(x) value/waarde CA from Q/ vanaf V 4.1.3(b) ✓ h(x) value/waarde CA from Q/ vanaf V 4.1.3(b) ✓ length/ lengte CA (3)
4.1.5	$x = -4$ or/ of $x = 2$ or/ of $x = 0$	✓ $x = -4$ CA from/ vanaf Q/ V 4.1.2 ✓ $x = 2$ A ✓ $x = 0$ A (3)
4.2.1 (a)	$y = (1,495)^0 - 5 = -4$ OR/OF $(0 ; -4)$	✓ -4 A (1)
4.2.1 (b)	$0 = (1,495)^x - 5$ $x = \log_{1,495} 5$ $\therefore x \approx 4$	✓ $y = 0$ A ✓ log form/ vorm A ✓ R CA (3)

4.2.2		g: ✓ all intercepts/alle afsnitte CA ✓ shape/ vorm A ✓ asymptote/asimptote A p: ✓ all intercepts/alle afsnitte A ✓ shape/vorm A (5)
4.2.3 (a)	$-4 \leq y \leq 0$ OR/OF $y \in [-4; 0]$ OR/OF $-4 \leq y$ and/ en $y \leq 0$	✓ both endpoints/ beide eindpunte CA - from Q/ vanaf V 4.2.1(b) ✓ notation/notasie A (2)
4.2.3 (b)	$m = \frac{0 - 4}{-4 - 0} = 1$ $y = mx + c$ OR/OF $y - y_1 = m(x - x_1)$ $y = 1x + (-4)$ $y - 0 = 1(x - (-4))$ $\therefore y = x - 4$ OR/OF $\frac{x}{4} + \frac{y}{-4} = 1$ $x - y = -4$ $\therefore y = x - 4$	✓ gradient/gradient CA ✓ equation/vergelyking CA OR/OF ✓ M ✓ equation/vergelyking CA AO: Full marks/ Volpunte (2)
4.2.3 (c)	$0 < x < 4$ OR/OF $x \in (0; 4)$ OR/OF $0 < x$ and/ en $x < 4$	✓ both endpoints/beide eindpunte CA ✓ notation/notasie CA (2)
4.2.3 (d)	$-4 < x \leq 0$ OR/OF $x \in (-4; 0]$ OR/OF $-4 < x$ and/ en $x \leq 0$	✓ both endpoints/ beide eindpunte CA ✓ notation/notasie CA (2)

QUESTION/VRAAG 5

5.1	$i_{\text{eff}} = \left(1 + \frac{i_n}{m}\right)^m - 1$ $8,5\% = \left(1 + \frac{i_n}{4}\right)^4 - 1$ $i = 4\left(\sqrt[4]{1,085} - 1\right)$ $\approx 0,0824$ nominal interest rate / nominale rentekoers $\approx 8,24\%$ OR/OF $A = P\left(1 + \frac{i}{m}\right)^{n \times m}$ $108,50 = 100\left(1 + \frac{i}{4}\right)^{1 \times 4}$ $i = 4\left(\sqrt[4]{\frac{108,50}{100}} - 1\right) \approx 0,082417$ nominal interest rate / nominale rentekoers $\approx 8,24\%$	✓ formula CA ✓ $m = 4$ CA ✓ rate/ koers CA OR/OF ✓ formula CA ✓ $m = 4$ CA ✓ rate/ koers CA (3) NPR
5.2	$A = P(1 - i)^n$ $152\,523 = P(1 - 0,11)^3$ $152\,523 = 0,704969P$ $P \approx R216\,354,19$	✓ SF A ✓ $152\,523 = 0,704969P$ CA ✓ value of/ waarde van P CA AO: Full marks/Volpunte (3) NPR

5.3.1	$A_{\text{Martin}} = P(1 + in)$ $= 13\,000(1 + 5 \times 0,058)$ $= R16\,770,00$ OR/OF $SI = P \times i \times n$ $= 13\,000 \times 5,8\% \times 5 = R3\,770$ $A_{\text{Martin}} = 13\,000 + 3\,770 = R16\,770$	✓ SF A ✓ answer/antwoord CA OR/OF ✓ SF A ✓ answer/antwoord (2)
AO: Full marks/ Volpunte		

5.3.2	$A_{\text{Nosizwe}} = P(1 + i)^n$ $= 8\,000 \left(1 + \frac{0,0764}{12}\right)^{24} (1 + 0,0812)^3 + 5\,000(1 + 0,0812)^3$ $= R18\,094,50$ $A_{\text{Martin}} + A_{\text{Nosizwe}} = R16\,770,00 + R18\,094,50$ $= R34\,864,50$ $R34\,864,50 < R35\,000$ They will NOT have enough/ Hulle sal NIE genoeg hê nie OR/OF $A_{\text{Nosizwe}} = P(1 + i)^n$ $= 8\,000 \left(1 + \frac{0,0764}{12}\right)^{24}$ $= R9\,316,222013$ $\text{New } P = R9\,316,222013 + R5\,000 = R14\,316,22$ $A_{\text{Nosizwe}} = R14\,316,222013(1 + 0,0812)^3$ $= R18\,094,50$ $A_{\text{Martin}} + A_{\text{Nosizwe}} = R16\,770,00 + R18\,094,50$ $= R34\,864,50$ $R34\,864,50 < R35\,000$ They will NOT have enough/ Hulle sal NIE genoeg hê nie	$\left(1 + \frac{0,0764}{12}\right)^{24}$ ✓ A ✓ R18 094,50 A ✓ calculating interest after adding R5000 at 8,12%/ bereken rente na byvoeg van R5000 teen 8,12% M ✓ R 34 864,50 CA ✓ conclusion/gevolgtrekking CA OR/OF $\left(1 + \frac{0,0764}{12}\right)^{24}$ ✓ A ✓ calculating interest after adding R5000 at 8,12%/ bereken rente na byvoeg van R5000 teen 8,12% M ✓ R18 094,50 CA ✓ R 34 864,50 CA ✓ conclusion/gevolgtrekking CA NPR
If a candidate indicate only conclusion without calculation: 0 marks Indien 'n kandidaat net die gevolgtrekking sonder berekening gee: 0 punte		
		(5)
		[13]

QUESTION/VRAAG 6**Penalty (1 mark) for incorrect notation only in QUESTION 6.1****Penaliseer (1 punt) vir verkeerde notasie slegs in VRAAG 6.1**

6.1	$f(x) = 2x + 3$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{2(x+h) + 3 - (2x + 3)}{h}$ $= \lim_{h \rightarrow 0} \frac{2x + 2h + 3 - 2x - 3}{h}$ $= \lim_{h \rightarrow 0} \frac{2h}{h}$ $= \lim_{h \rightarrow 0} (2)$ $= 2$	✓ definition/definisie A ✓ SF CA ✓ S CA ✓ S CA ✓ 2 CA AO: 0 marks/ Volpunte (5)
6.2.1	$y = -x^{-5} + 3x^4$ $\frac{dy}{dx} = 5x^{-6} + 12x^3$	✓ $5x^{-6}$ A ✓ $12x^3$ A (2)
6.2.2	$f(x) = \frac{3}{x^4} - \frac{x}{\sqrt{x}}$ $= 3x^{-4} - x^{\frac{1}{2}}$ $\therefore f'(x) = -12x^{-5} - \frac{1}{2}x^{-\frac{1}{2}}$ OR/OF $f'(x) = -\frac{12}{x^5} - \frac{1}{2\sqrt{x}}$	✓ $3x^{-4}$ A ✓ $x^{\frac{1}{2}}$ A ✓ $-12x^{-5}$ CA ✓ $-\frac{1}{2}x^{-\frac{1}{2}}$ CA (4)
6.2.3	$D_x \left[\frac{x^2 + x - 6}{x + 3} \right]$ $= D_x \left[\frac{(x+3)(x-2)}{x+3} \right]$ $= D_x [x - 2]$ $= 1$	✓ factors/ faktore A ✓ S CA ✓ 1 CA (3)

6.3	$m_{\text{ave}} = \frac{f(x_2) - f(x_1)}{x_2 - x_1}$ $= \frac{[-2(2)^2 + 2] - [-2(0)^2 + 2]}{2 - 0}$ $= \frac{-6 - 2}{2}$ $= -4$ OR/OF $y_1 = f(x_1) = -2(0)^2 + 2 = 2$ $y_2 = f(x_2) = -2(2)^2 + 2 = -6$ $m_{\text{ave}} = \frac{y_2 - y_1}{x_2 - x_1}$ $= \frac{-6 - 2}{2 - 0}$ $= -4$	✓ SF A ✓ S CA ✓ average gradient/ gemiddelde gradient CA OR/OF ✓ both values of/ Beide waardes van y A ✓ SF CA ✓ average gradient/ gemiddelde grad. CA (3)
6.4.1	$g(x) = 1 - x^2$ $g'(x) = -2x$ $m_{\text{tan}} = g'(-3) = -2(-3) = 6$	✓ derivative/ Afgeleide A ✓ gradient CA (2)
6.4.2	$g(-3) = 1 - (-3)^2 = -8$ OR/OF $y = mx + c$ $-8 = 6(-3) + c$ $-8 + 18 = c$ $c = 10$ $y = 6x + 10$	y-value / y-waarde A ✓ SF CA ✓ equation/ vergelyking CA (3) [22]

QUESTION/VRAAG 7		
7.1.1	B(0; -5)	✓ Coordinates of/koördinate van B A (1)
7.1.2	$h(x) = x^3 - 3x^2 - 9x - 5$ $h(-1) = (-1)^3 - 3(-1)^2 - 9(-1) - 5 = 0$ $\therefore x + 1$ is a factor / is 'n faktor	✓ SF A ✓ 0 A (2)
7.1.3	By inspection /Deur inspeksie $h(x) = (x^2 + 2x + 1)(x - 5)$ $h(x) = (x + 1)^2(x - 5)$ $\therefore x = -1$ or/of $x = 5$ $\therefore D(5; 0)$ OR/OF $h(x) = (x + 1)(x^2 - 4x - 5)$ $h(x) = (x + 1)(x - 5)(x + 1)$ x-intercepts/afsnitte ; $h(x) = 0$ $\therefore x = -1$ or/of $x = 5$ $\therefore D(5; 0)$ OR/OF $0 = (x + 1)(x^2 - 4x - 5)$ $x = -1$ or/of $x = \frac{-(-4) \pm \sqrt{(-4)^2 - 4(1)(-5)}}{2(1)}$ $\therefore x = -1$ or/of $x = 5$ $\therefore D(5; 0)$	✓ quadratic factor /kwadratties faktor A ✓ Other intercepts/ander afsnitte A ✓ Coordinates of/ koördinate van D CA OR/OF ✓ quadratic factor/ kwadratties faktor A ✓ Other factors /ander faktore A ✓ Coord. of/ koord. van D CA OR/OF ✓ quadratic factor/ kwadratties faktor A ✓ Other intercepts/ ander afsnitte A ✓ Coord. of / koord. van D CA AO: Full marks/ Volpunte (3)
7.1.4	$h'(x) = 3x^2 - 6x - 9$ $3x^2 - 6x - 9 = 0 \quad \therefore x^2 - 2x - 3 = 0$ $(x - 3)(x + 1) = 0$ OR $x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-3)}}{2(1)}$ $\therefore x = 3$ or/of $x = -1$ $h(3) = (3)^3 - 3(3)^2 - 9(3) - 5 = -32$ $\therefore C(3; -32)$	✓ derivative/afgeleide M ✓ equating derivative to 0/ stel afgeleide gelyk aan 0 M ✓ factors/formula/faktore/ formule CA ✓ $x = 3$ CA ✓ $y = -32$ CA (5)
7.2	$x < -1$ or/of $x > 3$ OR/OF $x \in (-\infty; -1) \cup (3; \infty)$	✓ both crit. values/beide krit. waarde CA ✓ notation/notasie CA OR/OF ✓ both crit. values/ beide krit. waarde CA ✓ notation/notasie CA (2) [13]

QUESTION/VRAAG 8			
8.1	$30 - 6t = 0$ $30 = 6t$ $t = 5 \text{ s}$	$\checkmark 30 - 6t$ A $\checkmark$ value of/waarde van t CA NPU (2)	
8.2.1	$s = 30t - 3t^2$ $\frac{ds}{dt} = 30 - 6t$ $= 30 - 6(0) \text{ m/s}$ $= 30 \times \frac{3600}{1000} \text{ km/h}$ $= 108 \text{ km/h}$ NO Penalty if correct unit omitted. Geen penaliseering indien korrekte eenheid uitgelaat	$\checkmark t = 0$ A $\checkmark \times \frac{3600}{1000}$ A $\checkmark S$ CA (3)	
8.2.2	$s = 30(5) - 3(5)^2 \text{ m}$ $= 75 \text{ m}$	$\checkmark$ substitution/vervanging A $\checkmark$ distance/afstand CA AO: Full marks/ Volpunte NPU (2)	
8.3	$75 \text{ m} > 70 \text{ m}$ Therefore car A will collide with the stationary car B / dus sal kar A met stasionêre kar B bots	$\checkmark$ reason/rede CA $\checkmark$ conclusion/gevolgtrekking CA (2) [9]	

QUESTION/VRAAG 9		
9.1.1	$\int \left(x^{-2} + \frac{1}{x} \right) dx$ $= -x^{-1} + \ln x + C \quad \text{OR/OF} \quad = -\frac{1}{x} + \ln x + C$	$\checkmark -x^{-1}$ or/of $-\frac{1}{x}$ A $\checkmark \ln x$ A $\checkmark C$ A (3)
9.1.2	$\int \left(x^{\frac{4}{3}} - 5x^4 \right) dx$ No penalty if C omitted Geen penaliseering indien C weggelaat is $= \frac{x^{\frac{4}{3}+1}}{\frac{4}{3}+1} - \frac{5x^{4+1}}{4+1} + C$ $= \frac{3x^{\frac{7}{3}}}{4} - x^5 + C$	$\checkmark \frac{x^{\frac{4}{3}+1}}{\frac{4}{3}+1}$ OR/OF $\frac{3x^{\frac{7}{3}}}{4}$ A $\checkmark -\frac{5x^{4+1}}{4+1}$ OR/OF $-x^5$ A (2)
9.2	$A = - \int_{-1}^2 (2x^3 - 4) dx$ $= - \left(\frac{x^4}{2} - 4x \right) \Big _{-1}^2$ $= - \left[\left(\frac{(2)^4}{2} - 4(2) \right) - \left(\frac{(-1)^4}{2} - 4(-1) \right) \right]$ $\therefore A = 4,5 \text{ square units/kwadraat eenhede}$ OR/OF $A = \int_{-1}^2 (2x^3 - 4) dx$ $= \left(\frac{x^4}{2} - 4x \right) \Big _{-1}^2$ $= \left[\frac{(2)^4}{2} - 4(2) \right] - \left[\frac{(-1)^4}{2} - 4(-1) \right]$ $= -4,5$ $\therefore A = 4,5 \text{ square units /kwadraat eenhede}$	$\checkmark$ Area notation using integrals/ Area-notasie met gebruik van integrale M $\checkmark \frac{x^4}{2}$ A $\checkmark -4x$ A $\checkmark \checkmark$ SF CA $\checkmark$ bounded area/ begrensde oppervaklte CA OR/OF $\checkmark$ Area notation using integrals/ Area-notasie met gebruik van integrale M $\checkmark \frac{x^4}{2}$ A $\checkmark -4x$ A $\checkmark \checkmark$ SF CA $\checkmark -4,5$ CA $\checkmark$ bounded area/ begrensde oppervaklte CA (6) [11]
TOTAL/ TOTAAL: 150		