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**NATIONAL
SENIOR CERTIFICATE /
NASIONALE
SENIORSERTIFIKAAT**

GRADE/GRAAD 12

SEPTEMBER 2023

**TECHNICAL MATHEMATICS P1
MARKING GUIDELINE
TEGNIESE WISKUNDE V1
NASIENRIGLYN**

MARKS/ PUNTE: 150

MARKING CODES/NASIENKODES	
A	Accuracy/ <i>Akkuraatheid</i>
AO	Answer only/ <i>slegs antwoord</i>
CA	Consistent accuracy/ <i>Volgehoue akkuraatheid</i>
M	Method/ <i>Metode</i>
R	Rounding/ <i>Afronding</i>
NPR	No penalty for rounding/ <i>Geen penalisering vir afronding nie</i>
NPU	No penalty for units omitted/ <i>Geen penalisering vir eenhede weggelaat nie</i>
S	Simplification/ <i>Vereenvoudiging</i>
SF	Substitution in the correct formula/ <i>Vervanging in die korrekte formule</i>

These marking guidelines consist of 18 pages.
Hierdie nasienriglyne bestaan uit 18 bladsye.

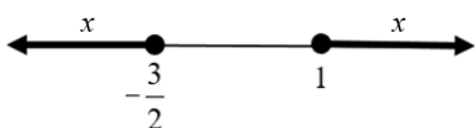
NOTE:

- 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.

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.

QUESTION/VRAAG 1

1.1.1	$(x+17)(x-23)=0$ $x=-17$ or/of $x=23$	$\checkmark x=-17$ $\checkmark x=23$	A A (2)
1.1.2	$\frac{x^2}{2} + x - \frac{1}{3} = 0$ $x = \frac{-(1) \pm \sqrt{(1)^2 - 4\left(\frac{1}{2}\right)\left(-\frac{1}{3}\right)}}{2\left(\frac{1}{2}\right)}$ $\therefore x = -2,29$ or/of $x = 0,29$	\checkmark Substitution / <i>vervanging</i> $\checkmark x = -2,29$ $\checkmark x = 0,29$	A CA CA <div style="border: 1px solid black; display: inline-block; padding: 2px;">R</div> (3)
1.1.3	$x(2x+1)-3 \leq 0$ $2x^2+x-3 \leq 0$ $(2x+3)(x-1) \leq 0$ CVs/KWs: $-\frac{3}{2}$ and/en 1 $\therefore x \leq -\frac{3}{2}$ or/of $x \geq 1$ OR/OF 	\checkmark Standard form / <i>standaardvorm</i> \checkmark Factorisation / <i>faktorisering</i> / \checkmark Both critical values / <i>beide kritiese waardes</i> \checkmark correct notation / <i>korrekte notasie</i>	A SF CA CA CA OR/OF CA (4)



1.2	$y = x + 1 \dots\dots\dots(1)$ <p>and/en</p> $y = 3x^2 - xy \dots\dots\dots(2)$ $3x^2 - x(x + 1) = x + 1$ $3x^2 - x^2 - x - x - 1 = 0$ $2x^2 - 2x - 1 = 0$ $x = \frac{-(-2) \pm \sqrt{(-2)^2 - 4(2)(-1)}}{2(2)}$ $x = 1,37 \text{ or/of } x = -0,37$ $y = 1,37 + 1 \text{ or/of } y = -0,37 + 1$ $y = 2,37 \text{ or/of } y = 0,63$ <p style="text-align: center;">OR/OF</p> $x = y - 1 \dots\dots\dots(3)$ <p>and/en</p> $y = 3x^2 - xy$ $y = 3(y - 1)^2 - y(y - 1)$ $y = 3(y^2 - 2y + 1) - y^2 + y$ $0 = 3y^2 - 6y + 3 - y^2$ $0 = 2y^2 - 6y + 3$ $y = \frac{-(-6) \pm \sqrt{(-6)^2 - 4(2)(3)}}{2(2)}$ $\therefore y = 2,37 \text{ or/of } y = 0,63$ $x = 2,37 - 1 \text{ or/of } x = 0,63 - 1$ $\therefore x = 1,37 \text{ or/of } x = -0,37$	 <p>✓ Equating equations/ <i>Gelykstellende vergelykings</i> A</p> <p>✓ Substitution/<i>vervanging</i> CA</p> <p>✓ Correct standard form/ <i>Korrekte standaardvorm</i> CA</p> <p>✓ Both <i>x</i>-values/<i>beide x-waardes</i> CA</p> <p>✓ Both <i>y</i>-values/<i>beide y-waardes</i> CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ <i>x</i> subject/<i>onderwerp</i> A</p> <p>✓ Substitution/<i>vervanging</i> CA</p> <p>✓ Correct standard form/ <i>Korrekte standaardvorm</i> CA</p> <p>✓ both <i>y</i>-values /<i>beide y-waardes</i> CA</p> <p>✓ both <i>x</i> -values/<i>beide x-waardes</i> CA</p> <p style="text-align: right;">NPR (5)</p>
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1.3.1	$D = 100 \left(\frac{E - F}{E} \right)$ $D.E = 100(E - F)$ $D.E = 100E - 100F$ $100F = 100E - D.E$ $100F = (100 - D)E$ $\therefore E = \frac{100F}{100 - D}$ <p style="text-align: center;">OR/OF</p> $D = 100 \left(\frac{E - F}{E} \right)$ $D.E = 100(E - F)$ $\frac{D.E}{100} = E - F$ $\frac{D.E}{100} - E = -F$ $E \left(\frac{D}{100} - 1 \right) = -F$ $E = \frac{F}{\frac{D}{100} - 1}$	<p>✓ D.E subject /onderwerp A</p> <p>✓ $100E - 100F$ A</p> <p>✓ Common factor/gemene faktor CA</p> <p>✓ E subject/onderwerp CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ D.E subject /onderwerp A</p> <p>✓ $E - F$ A</p> <p>✓ Common factor/gemene faktor CA</p> <p>✓ E subject /onderwerp CA</p> <p style="text-align: right;">(4)</p>
1.3.2	$E = \frac{100F}{100 - D}$ $E = \frac{100(80)}{100 - 3,75}$ $\therefore E = 83,17 \text{ kg}$	<p>✓ Substitution/vervanging A</p> <p>✓ $E = 83,17$ CA</p> <p style="text-align: right;">(2)</p>
1.3.3	$E = 83,17 \times 1000\text{g}$ $E = 83170\text{g}$	<p>✓ 83170 CA</p> <p style="text-align: right;">(1)</p>



1.3.4	$E = 83170\text{g} = 8,3170 \times 10^4 \text{g}$	✓ $8,3170 \times 10^4$	CA (1)
1.4	$\begin{array}{r} 1000_2 \\ -110_2 \\ \hline 10_2 \end{array}$ <p style="text-align: center;">OR/OF</p> $2^3 - (2^2 + 2^1)$ $= 2$ $\therefore 1000_2 - 110_2 = 10_2$	✓ Method/metode ✓ 10_2 OR/OF ✓ Method/metode ✓ 10_2	A A A A (2)
			[24]



QUESTION/VRAAG 2

2.1	$\Delta = b^2 - 4ac$ $6 = (-3)^2 - 4a(2)$ $6 - 9 = -8a$ $-3 = -8a$ $a = \frac{3}{8}$	✓ Formula /formule A ✓ Substitution/vervanging CA ✓ $a = \frac{3}{8}$ CA (3)
2.2	Roots are Real, irrational and unequal. / <i>Wortels is Reëel, irrasionaal en ongelyk</i> Accept Real and Unequal / Aanvaar Reëel en ongelyk	✓ Irrational/irrasionaal A (1)
2.3	$b^2 - 4ac = 0$ $(-3)^2 - 4a(2) = 0$ $9 - 8a = 0$ $a = \frac{9}{8}$	✓ $\Delta = 0$ A ✓ Substitution/vervanging CA ✓ $a = \frac{9}{8}$ CA (3)
[7]		

QUESTION/VRAAG 3

3.1.1	$\log_x \left(\frac{1}{x} \right)$ $= \log_x x^{-1}$ $= -1$	✓ Exponential form / <i>eksponensiële vorm</i> A ✓ Log property/eienskap CA (2)
3.1.2	$4^x - 2^{2x-1}$ $= (2^2)^x - 2^{2x-1}$ $= 2^{2x} - 2^{2x} \cdot 2^{-1}$ $= 2^{2x}(1 - 2^{-1})$ $= 2^{2x} \cdot 2^{-1}$ $= 2^{2x-1}$ <p style="text-align: center;">OR/OF</p>	✓ Prime factorisation / <i>priem</i> <i>faktorisering</i> A ✓ Factorisation/ <i>faktorisering</i> CA ✓ 2^{2x-1} CA <p style="text-align: center;">OR/OF</p>



	$4^x - 2^{2x-1}$ $= 4^x - 2^{2x} \cdot 2^{-1}$ $= 4^x - 4^x \cdot 2^{-1}$ $= 4^x(1 - 2^{-1})$ $= 4^x \cdot 2^{-1}$	<p>✓ Exponential law/<i>eksponensiële wet</i> A</p> <p>✓ Factorisation/<i>faktorisering</i> CA</p> <p>✓ $4^x \cdot 2^{-1}$ CA</p> <p>(3)</p>
3.2	$\frac{\sqrt{3x^2} \times \sqrt[3]{12x^3}}{2x^2} = \frac{\sqrt[6]{243}}{\sqrt[3]{2}}$ $\text{LHS/LK} = \frac{\sqrt{3x^2} \times \sqrt[3]{12x^3}}{2x^2}$ $= \frac{x\sqrt{3} \times x\sqrt[3]{2^2 \cdot 3}}{2x^2}$ $= \frac{\sqrt{3} \times \sqrt[3]{2^2 \cdot 3}}{2}$ $= \frac{1}{3^2} \times \frac{2}{3} \cdot \frac{1}{3^3}$ $= \frac{1+1}{3^2 \cdot 3}$ $= \frac{1-\frac{2}{3}}{2}$ $= \frac{3^{\frac{5}{6}}}{2^{\frac{1}{3}}} = \frac{\sqrt[6]{3^5}}{\sqrt[3]{2}}$ $= \frac{\sqrt[6]{243}}{\sqrt[3]{2}} = \text{RHS/RK}$	<p>✓ Prime factorisation/<i>priem faktorisering</i> A</p> <p>✓ Simplification/<i>vereenvoudiging</i> CA</p> <p>✓ Same base law/<i>dieselfde basis wet</i> CA</p> <p>✓ Exponential property/<i>eksponensiële eienskap</i></p> <p>(4)</p>
3.3.1	$z = 3 - 4i$	<p>✓ $z = 3 - 4i$ A</p> <p>(1)</p>
3.3.2	$ z = \sqrt{(3)^2 + (-4)^2}$ $ z = 5$	<p>✓ Substitution/<i>vervanging</i> CA</p> <p>✓ $z = 5$ CA</p> <p>(2)</p>



3.3.3	$RA/VH: \tan \theta = \frac{4}{3}$ $RA/VH: \theta = 53,13^\circ$ $\theta = 360^\circ - 53,13^\circ$ $\theta = 306,87^\circ$	\checkmark tan ratio /verhouding CA \checkmark Reference angle / verwysingshoek CA \checkmark 306,87° CA (3)
3.3.4	$z = 5cis306,87^\circ$	$\checkmark z = 5cis306,87^\circ$ CA (1)
3.4	$\frac{x-i}{2i+1} = y+3i$ $x-i = (y+3i)(2i+1)$ $x-i = 2yi + y + 6i^2 + 3i$ $x-i = (2y+3)i + y-6$ $2y+3 = -1 \text{ and/en } x = y-6$ $y = -2 \text{ and/en } x = -8$ <p style="text-align: center;">OR /OF</p> $\frac{x-i}{2i+1} = y+3i$ $\frac{(x-i)(2i-1)}{(2i+1)(2i-1)} = y+3i$ $\frac{2xi - x - 2i^2 + i}{4i^2 - 1} = y+3i$ $\frac{(2x+1)i - x + 2}{-4-1} = y+3i$ $(2x+1)i - x + 2 = -5y - 15i$ $2x+1 = -15 \text{ and/en } -x+2 = -5y$ $\therefore x = -8 \text{ and/en } -(-8)+2 = -5y$ $x = -8 \text{ and/en } y = -2$	\checkmark Simplification / vereenvoudiging A $\checkmark i^2 = -1$ A \checkmark Simplification / vereenvoudiging CA $\checkmark x = -8$ CA $\checkmark y = -2$ CA <p style="text-align: center;">OR/OF</p> \checkmark Simplification / vereenvoudiging A $\checkmark i^2 = -1$ A \checkmark Simplification / vereenvoudiging CA $\checkmark x = -8$ CA $\checkmark y = -2$ CA (5) [21]



QUESTION/VRAAG 4

4.1.1	$y = -1$	✓ $y = -1$	A (1)
4.1.2	$0 = -\frac{2}{x} - 1$ $1 = -\frac{2}{x}$ $x = -2$	✓ $y = 0$ ✓ Simplification/ vereenvoudiging ✓ $x = -2$	A CA (1)
4.1.3		✓ Shape/vorm ✓ x - intercept/afsnit ✓ Asymptote/asimptoot	CA CA CA (3)
4.1.4	$y \neq -1$ OR / OF $-\infty < y < -1$ or / of $-1 < y < \infty$ OR / OF $y \in (-\infty; -1)$ or / of $y \in (-1; \infty)$	✓ $y \neq -1$	A (1)



4.2.1	$y = -2$	$\checkmark y = -2$	A (1)
4.2.2	$y = -3$	$\checkmark y = -3$	A (1)
4.2.3	$0 = x^2 - x - 2$ $0 = (x-2)(x+1)$ $x = -1$ or/of $x = 2$	$\checkmark y = 0$ \checkmark Factorization/ Substitution /Faktoriserings /Vervanging $\checkmark x = -1$ or/of $x = 2$	A CA (3)
4.2.4	$0 = 2^x - 3$ $3 = 2^x$ $x = \log_2 3$ $x = 1,58$	$\checkmark y = 0$ \checkmark log function/funksie $\checkmark x = 1,58$	A A A (3)
4.2.5	$k(x) = x^2 - x - 2$ $k'(x) = 2x - 1 = 0$ OR / OF $x = -\frac{(-1)}{2(1)}$ OR / OF $x = \frac{-1+2}{2}$ $x = \frac{1}{2}$ $k\left(\frac{1}{2}\right) = \left(\frac{1}{2}\right)^2 - \frac{1}{2} - 2$ $k\left(\frac{1}{2}\right) = -\frac{9}{4}$	$\checkmark k'(x)$ $\checkmark k'(x) = 0$ $\checkmark x = \frac{1}{2}$ $\checkmark k\left(\frac{1}{2}\right) = -\frac{9}{4}$	A A CA CA (4)
4.2.6	$x \in R$ OR/OF $x \in (-\infty; \infty)$ OR/OF $-\infty < x < \infty$	$\checkmark x \in R$	A (1)
4.2.7	$x = 0$	$\checkmark x = 0$	A (1)
4.3.1	$0 = x + 1$ $x = -1$	$\checkmark y = 0$ $\checkmark x = -1$	A A (2)
4.3.2(a)	$B(0 ; 3)$	$\checkmark x = 0$ $\checkmark y = 3$	A A (2)
4.3.2(b)	$h(x) = x + 3$	$\checkmark h(x) = x + 3$	A (1)
4.3.2(c)	$g(x) = \sqrt{9-x^2}$	$\checkmark g(x) = \sqrt{9-x^2}$	CA (1) [28]



QUESTION/VRAAG 5

5.1	$A = P(1-i)^n$ $A = 15000 \left(1 - \frac{0,03}{4}\right)^{5 \times 4}$ $= R12\,903,32$	✓ Formula /formule A ✓ Substitution /vervang A ✓ R12 903,32 CA (3)
5.2.1	R15,00	✓ R15,00 A (1)
5.2.2	$A = P(1+i)^n$ $18,80 = 3,80(1+i)^{20}$ $\frac{94}{19} = (1+i)^{20}$ $\sqrt[20]{\frac{94}{19}} = 1+i$ $i = 0,0832$ Rate/Koers = 8,32%	✓ Substitute/vervang <i>A</i> and/en <i>P</i> A ✓ Substitute/vervang <i>n</i> A ✓ Simplification /vereenvoudiging CA ✓ Simplification /vereenvoudiging CA ✓ 8,32 CA (5)



5.3	$A = P(1+i)^n$ $A_4 = R350\,000(1+0,07)^4 + x$ $A_4 = 458\,778,6035 + x$ $A_6 = (458\,778,6035 + x)(1+0,07)^2 - 100\,000$ $A_6 = 425\,255,6231 + 1,1449x$ $A_8 = (425\,255,6231 + 1,1449x)\left(1 + \frac{0,07}{12}\right)^{2 \times 12} = 620\,000$ $1,1449x = \frac{620\,000}{\left(1 + \frac{0,07}{12}\right)^{2 \times 12}} - 425\,255,6231$ $\therefore x = R99\,542,12$ <p style="text-align: center;">OR/OF</p> $[R350\,000(1,07)^6 + x(1,07)^2 - R100\,000]\left(\frac{1207}{1200}\right)^{24} = R620\,000$ $425\,255,6231 + x(1,07)^2 = 539\,221,3909$ $x = R99\,542,12$	$\checkmark R350\,000(1+0,07)^4 \quad \mathbf{A}$ $\checkmark \mathbf{M} \text{ adding/tel by } x \quad \mathbf{A}$ $\checkmark (458\,778,6035 + x)(1+0,07)^2$ <p style="text-align: right;">CA</p> $\checkmark \mathbf{M} \text{ subtracting/trek af } 100\,000$ <p style="text-align: right;">A</p> $\checkmark \text{ Substitution/vervangings } \quad \mathbf{CA}$ $\checkmark R99\,542,12 \quad \mathbf{CA}$ <p style="text-align: center;">OR/OF</p> $\checkmark R350\,000(1,07)^6$ $\checkmark +x(1,07)^2$ $\checkmark \mathbf{M} \text{ subtracting/trek af } 100\,000$ <p style="text-align: right;">A</p> $\checkmark \left(\frac{1207}{1200}\right)^{24}$ $\checkmark = R620\,000$ $\checkmark x = R99\,542,12$ <p style="text-align: right;">(6) [15]</p>
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QUESTION/VRAAG 6

6.1	$f(x) = 2 - 5x$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{2 - 5(x+h) - (2 - 5x)}{h}$ $= \lim_{h \rightarrow 0} \frac{-5x - 5h + 5x}{h}$ $= \lim_{h \rightarrow 0} \frac{-5h}{h}$ $= \lim_{h \rightarrow 0} -5$ $\therefore f'(x) = -5$ <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p>Penalty of one mark for incorrect notation</p> <p><i>Penaliseer een punt indien notasie foutief is.</i></p> </div>	<p>✓ Definition/definisie A</p> <p>✓ SF CA</p> <p>✓ S CA</p> <p>✓ S CA</p> <p>✓ -5 CA</p> <div style="border: 1px solid black; padding: 5px; margin: 10px auto; width: fit-content;"> <p>AO: 1 mark/punt</p> </div> <p style="text-align: right;">(5)</p>
6.2.1	$D_x \left(\frac{1}{\sqrt{x}} - 3kx \right)$ $= D_x \left(\frac{1}{x^{\frac{1}{2}}} - 3kx \right)$ $= D_x \left(x^{-\frac{1}{2}} - 3kx \right)$ $= -\frac{1}{2} x^{-\frac{3}{2}} - 3k$	<p>✓ Exponential form /eksponensiële vorm A</p> <p>✓ Simplification/vereenvoudiging CA</p> <p>✓ $-\frac{1}{2} x^{-\frac{3}{2}}$ CA</p> <p>✓ $-3k$ A</p> <p style="text-align: right;">(4)</p>

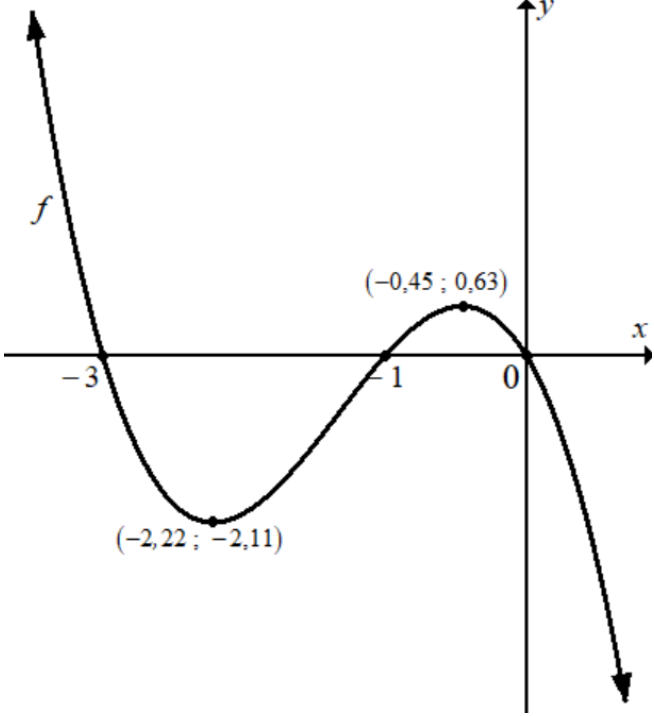


6.2.2	$\frac{dy}{dx} \text{ if: } y = \frac{2x^3 - 8x}{x - 2}$ $y = \frac{2x(x^2 - 4)}{x - 2}$ $y = \frac{2x(x - 2)(x + 2)}{x - 2}$ $y = 2x(x + 2)$ $y = 2x^2 + 4x$ $\frac{dy}{dx} = 4x + 4$	<p>✓ Factorisation/faktorisering A</p> <p>✓ $2x^2 + 4x$ CA</p> <p>✓ $4x$ CA</p> <p>✓ 4 CA (4)</p>
6.3	$h(x) = 3x^2 - 4x$ $h'(x) = 6x - 4 = 2$ $x = 1$ $h(1) = 3(1)^2 - 4(1)$ $h(1) = -1$	<p>✓ $h'(x)$ A</p> <p>✓ $h'(x) = 2$ A</p> <p>✓ $x = 1$ CA</p> <p>✓ $h(1) = -1$ CA (4)</p>
		[17]

QUESTION/VRAAG 7

7.1	$0 = -x^3 - 4x^2 - 3x$ $0 = -x(x^2 + 4x + 3)$ $0 = -x(x + 1)(x + 3)$ $x = 0$ or/of $x = -1$ or/of $x = -3$	$\checkmark y = 0$ A \checkmark Factorisation/ <i>faktorisering</i> A $\checkmark x = 0$ CA $\checkmark x = -1$ or/of $x = -3$ CA	(4)
7.2	$y = 0$	$\checkmark y = 0$	A (1)
7.3	$f(x) = -x^3 - 4x^2 - 3x$ $f'(x) = -3x^2 - 8x - 3 = 0$ $x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(-3)(-3)}}{2(-3)}$ $\therefore x = -2,22$ or/of $x = -0,45$ $y = -(-2,22)^3 - 4(-2,22)^2 - 3(-2,22)$ $y = -2,11$ or/of $y = -(-0,45)^3 - 4(-0,45)^2 - 3(-0,45)$ $y = 0,63$	$\checkmark f'(x)$ A $\checkmark f'(x) = 0$ A \checkmark Substitution/ <i>vervanging</i> CA \checkmark Both x -values/ <i>beide x-waardes</i> CA \checkmark Both y -values/ <i>beide y-waardes</i> CA	(5)



7.4		<p>✓ Shape /vorm A</p> <p>✓ Negative x-intercepts/negatiewe x-afsnitte CA</p> <p>✓ y-intercept/afsnit CA</p> <p>✓ Both turning points/beide draaipunte CA</p> <p style="text-align: right;">(4)</p>
7.5	$f(-2) = -(-2)^3 - 4(-2)^2 - 3(-2) = -2$ $f(-1) = -(-1)^3 - 4(-1)^2 - 3(-1) = 0$ $\text{Average gradient} = \frac{0 - (-2)}{-1 - (-2)}$ $\therefore \text{Gemiddelde gradiënt} = 2$	<p>✓ -2 A</p> <p>✓ 0 A</p> <p>✓ SF CA</p> <p>✓ Ave/Gemid grad = 2 CA</p> <p style="text-align: right;">(4)</p> <p style="text-align: right;">[18]</p>



QUESTION/VRAAG 8

8.1	$s = ut + \frac{1}{2}gt^2$ $s = 5 \times 4 + \frac{1}{2}(10)(4)^2$ $s = 100 \text{ m}$	<div style="border: 1px solid black; padding: 2px; display: inline-block;">NPU</div>	✓ Substitution/ <i>vervang</i> A ✓ $s = 100 \text{ m}$ CA (2)
8.2	$\frac{ds}{dt} = v = u + gt$ OR/OF $\frac{ds}{dt} = 5 + 10t$		✓ u A ✓ gt A OR/OF ✓ 5 ✓ $10t$ (2)
8.3	$v = u + gt$ $v = 5 + 10(4)$ $v = 45 \text{ m/s}$	<div style="border: 1px solid black; padding: 2px; display: inline-block;">NPU</div>	✓ Substitution/ <i>vervang</i> CA ✓ 45 m/s CA (2)
8.4	Average rate of change = $\frac{45 - 5}{4 - 0}$ \therefore (<i>Gemid tempo verandering</i>) = 10 m/s^2	<div style="border: 1px solid black; padding: 2px; display: inline-block;">NPU</div>	✓ Substitution/ <i>vervang</i> CA ✓ 10 m/s CA (2)

[8]

QUESTION/VRAAG 9

9.1.1	$\int (x^3 - 8) dx$ $= \frac{x^4}{4} - 8x + c$	$\checkmark \frac{x^4}{4}$ $\checkmark -8x$ $\checkmark c$	A A A
9.1.2	$\int \left(\frac{f(x)}{x^2 + 2x + 4} - 2^{3x} \right) dx$ $= \int \left(\frac{x^3 - 8}{x^2 + 2x + 4} - 2^{3x} \right) dx$ $= \int \left(\frac{(x-2)(x^2 + 2x + 4)}{x^2 + 2x + 4} - 2^{3x} \right) dx$ $= \int (x - 2 - 2^{3x}) dx$ $= \frac{x^2}{2} - 2x - \frac{2^{3x}}{3 \ln 2} + c$	\checkmark Factors/faktore \checkmark Simplification/vereenvoudiging $\checkmark \frac{x^2}{2} - 2x$ $\checkmark -\frac{2^{3x}}{3 \ln 2} + c$	A CA CA CA
9.2	$\text{Area} = -\int_{-1}^1 (x^3 - 1) dx$ $\text{Area} = -\left[\frac{x^4}{4} - x \right]_{-1}^1$ $\text{Area} = -\left[\left(\frac{(1)^4}{4} - (1) \right) - \left(\frac{(-1)^4}{4} - (-1) \right) \right]$ $= -\left(\frac{(1)^4}{4} - (1) \right) + \left(\frac{(-1)^4}{4} - (-1) \right)$ $\text{Area} = \frac{3}{4} + \frac{5}{4}$ $= 2 \text{ sq units/vk eenhede}$	\checkmark Area notation/notasie \checkmark Integral/integraal $\checkmark \checkmark$ Substitution/vervanging \checkmark Area = 2	A A CA CA CA

[12]**TOTAL/TOTAAL: 150**