



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 2018

MARKING GUIDELINES/NASIENRIGLYNE

MARKS: 150

PUNTE: 150

<i>Marking Codes / Nasienkodes</i>	
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
SF	Substitution in correct formula/ Vervanging in korrekte formule

**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.
- Consistent accuracy applies in all aspects of the marking guidelines where appropriate.

LET WEL:

- Indien 'n kandidaat 'n vraag TWEE keer beantwoord, sien slegs die EERSTE poging na.
- Volgehoue akkuraatheid is deurgaans op alle aspekte van die nasienriglyne van toepassing.

QUESTION/VRAAG 1

1.1.1	$-2x(x+a)(3-x) = 0$ $x = 0 \quad \text{or/of} \quad x = -a \quad \text{or/of} \quad x = 3$	$\checkmark x = 0 \quad \text{A}$ $\checkmark x = -a \quad \text{A}$ $\checkmark x = 3 \quad \text{A}$ (3)
1.1.2	$2x = 6 - x^2$ $x^2 + 2x - 6 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-2 \pm \sqrt{2^2 - 4(1)(-6)}}{2(1)}$ $= \frac{-2 \pm \sqrt{28}}{2}$ $\therefore x \approx 1,65 \quad \text{or/of} \quad x \approx -3,65$ <p style="text-align: center;">OR/OF</p> $2x = 6 - x^2$ $x^2 + 2x = 6$ $x^2 + 2x + 1 = 6 + 1$ $(x + 1)^2 = 7$ $x + 1 = \pm \sqrt{7}$ $x = -1 \pm \sqrt{7}$ $\therefore x \approx 1,65 \quad \text{or/of} \quad x \approx -3,65$	\checkmark standard form/ <i>standaardvorm</i> \checkmark SF CA \checkmark S CA \checkmark both values of/ <i>beide waardes van x</i> CA <p style="text-align: center;">OR/OF</p> \checkmark completing square/ <i>kwadraatsvoltooiing</i> \checkmark square as subject/ <i>vierkant as onderwerp</i> CA \checkmark square root/ <i>vierkantswortel</i> CA \checkmark both values of/ <i>beide waardes van x</i> CA NPR <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> AO, full marks (exact values)/ volpunte (eksakte waardes) </div> (4)

<p>1.1.3</p>	<p>$5x(x-3) \leq 0$ Critical values: 0 and 3 $\therefore 0 \leq x \leq 3$ OR / OF $x \in [0;3]$ OR/OF $x \geq 0$ and $x \leq 3$</p> 	<p>✓ both critical values/ <i>albei kritiese waardes</i> ✓ notation/<i>notasie</i> ✓ graphical representation/ <i>grafiese voorstelling</i> CA</p> <p>(3)</p>
<p>1.2</p>	<p>$y - 2x = -7$ and $x^2 + xy + y^2 = 21$ $y = 2x - 7$ $x^2 + x(2x - 7) + (2x - 7)^2 = 21$ $x^2 + 2x^2 - 7x + 4x^2 - 28x + 49 - 21 = 0$ $7x^2 - 35x + 28 = 0$ $x^2 - 5x + 4 = 0$ OR/OF $(7x - 28)(x - 1) = 0$ $(x - 4)(x - 1) = 0$ $\therefore x = 4$ or $x = 1$ $y = 2(4) - 7$ or $y = 2(1) - 7$ $y = 1$ or $y = -5$ $\therefore y = 1$ and $x = 4$</p> <p>OR/OF</p> <p>$y - 2x = -7$ $x = \frac{y + 7}{2}$ $x^2 + xy + y^2 = 21$ $\left(\frac{y + 7}{2}\right)^2 + y\left(\frac{y + 7}{2}\right) + y^2 = 21$ $\frac{y^2 + 14y + 49}{4} + \frac{y^2}{2} + \frac{7y}{2} + y^2 = 21$ $y^2 + 14y + 49 + 2y^2 + 14y + 4y^2 = 84$ $7y^2 + 28y - 35 = 0$ $y^2 + 4y - 5 = 0$ $(y + 5)(y - 1) = 0$ OR/OF $(y + 5)(7y - 7) = 0$ $\therefore y = -5$ or $y = 1$ $x = 1$ or/of $x = 4$ $\therefore y = 1$ and/en $x = 4$</p>	<p>✓ y subject of formula/ <i>onderwerp van formule</i> ✓ SF CA ✓ S CA ✓ factors/<i>faktore</i> CA ✓ x-values/<i>-waardes</i> CA ✓ y-values/<i>-waardes</i> CA ✓ $y = 1$ and/en $x = 4$ CA</p> <p>OR/OF</p> <p>✓ x subject of formula/ <i>onderwerp van formule</i> ✓ substitution/<i>vervanging</i> CA ✓ correct standard form/ <i>korrekte standaardvorm</i> CA ✓ factors/<i>faktore</i> CA ✓ y-value/<i>-waarde</i> CA ✓ x-values/<i>-waardes</i> CA ✓ $y = 1$ and/en $x = 4$ CA</p> <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p>If not squaring y or x after substitution, then a maximum of 6 marks, Indien geen kwadrering van y of x na vervanging, dan 'n maksimum van 6 punte</p> </div> <p>(7)</p>

<p>1.3.1</p>	$E = \frac{1}{12} ML^2$ $L^2 = \frac{12E}{M}$ $\therefore L = \sqrt{\frac{12E}{M}} \quad \text{OR / OF} \quad 2\sqrt{\frac{3E}{M}} \quad \text{OR / OF} \quad \sqrt{\frac{E}{\frac{1}{12}M}}$	<p>✓ L^2 subject/onderwerp</p> <p>✓ L subject/ onderwerp CA</p> <p style="text-align: right;">(2)</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>AO, full marks /volpunte</p> </div>
<p>1.3.2</p>	$L = \sqrt{\frac{12E}{M}}$ $= \sqrt{\frac{12(8,3 \times 10^{-2})}{1,6 \times 10^3}}$ $\therefore L \approx 0,02 \text{ m}$ <p style="text-align: center;">OR/OF</p> $L = 2\sqrt{\frac{3E}{M}}$ $= 2\sqrt{\frac{3(8,3 \times 10^{-2})}{1,6 \times 10^3}}$ $\therefore L \approx 0,02 \text{ m}$ <p style="text-align: center;">OR/OF</p> $E = \frac{1}{12} ML^2$ $8,3 \times 10^{-2} = \frac{1}{12} (1,6 \times 10^3) L^2$ $L = \sqrt{\frac{12(8,3 \times 10^{-2})}{1,6 \times 10^3}}$ $\therefore L \approx 0,02 \text{ m}$	<p>CA from Question 1.3.1/ van Vraag 1.3.1</p> <p>✓ SF CA</p> <p>✓ value of/waarde van L CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ SF CA</p> <p>✓ value of/waarde van L CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ SF CA</p> <p>✓ value of/waarde van L CA</p> <p style="text-align: right;">(2)</p> <p>NPU NPR (Accept scientific notation/Aanvaar wetenskaplike notasie)</p>
<p>1.4</p>	$36 = 32 + 4$ $= 100100_2$	<p>✓ $32 + 4$ A</p> <p>✓ 100100_2 A</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>AO: Full marks/ Volpunte</p> </div> <p style="text-align: right;">(2)</p> <p style="text-align: right;">[23]</p>

QUESTION/VRAAG 2

2.1	$x = \frac{-8 \pm \sqrt{q - 3}}{2}$	
2.1.1	Irrational / <i>Irrasionaal</i>	✓ irrational / <i>irrasionaal</i> (Accept: real and unequal/ <i>Aanvaar: reeel en ongelyk</i>) (1)
2.1.2	Equal / <i>gelyk</i>	✓ equal (Accept: real OR rational/ <i>Aanvaar: reel OF rasionaal</i>) (1)
2.1.3	Non-real <i>Nie-reël</i>	✓ non-real/ <i>nie-reël</i> (accept imaginary/ <i>aanvaar imaginer</i>) (1)
2.2	$3x^2 + 7x = 2x + p$ $3x^2 + 5x - p = 0$ $\Delta = b^2 - 4ac < 0$ $(5)^2 - 4(3)(-p) < 0$ $25 + 12p < 0$ $p < -\frac{25}{12}$	✓ standard form/ <i>standaardvorm</i> ✓ SF in Δ CA ✓ correct inequality/ <i>korrekte ongelykheid (<0) A</i> ✓ values of/waardes van <i>p</i> CA (4) [7]

QUESTION/VRAAG 3

<p>3.1.1</p>	$\left(2a^{\frac{7}{3}}\right)^3 = 2^3 \times \left(a^{\frac{7}{3}}\right)^3$ $= 8a^7$ <p style="text-align: center;">OR/OF</p> $\left(2a^{\frac{7}{3}}\right)^3 = \left(2a^{\frac{7}{3}}\right)\left(2a^{\frac{7}{3}}\right)\left(2a^{\frac{7}{3}}\right)$ $= 8a^7$	<p>✓ exponent property/ <i>eksponenteienskap</i> A</p> <p>✓ S CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ exponent property/<i>eksponenteienskap</i> A</p> <p>✓ S CA</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;"> AO: Full marks / Volpunte </div> <p style="text-align: right;">(2)</p>
<p>3.1.2</p>	$\log_p p + \log_m 1$ $= 1 + 0$ $= 1$	<p>✓ 1 A</p> <p>✓ 0 A</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;"> AO: only one mark/ <i>slegs een punt</i> </div> <p style="text-align: right;">(2)</p>
<p>3.1.3</p>	$\frac{\sqrt{48} - \sqrt{12}}{2\sqrt{75}}$ $= \frac{\sqrt{3 \times 16} - \sqrt{3 \times 4}}{2\sqrt{3 \times 25}}$ $= \frac{4\sqrt{3} - 2\sqrt{3}}{2 \times 5\sqrt{3}} \quad \text{OR} \quad \frac{\sqrt{3}(4 - 2)}{10\sqrt{3}}$ $= \frac{2\sqrt{3}}{10\sqrt{3}}$ $= \frac{1}{5}$ <p style="text-align: center;">OR/OF</p> $\frac{\sqrt{48} - \sqrt{12}}{2\sqrt{75}}$ $= \frac{\sqrt{48}}{2\sqrt{75}} - \frac{\sqrt{12}}{2\sqrt{75}}$ $= \frac{4\sqrt{3}}{10\sqrt{3}} - \frac{2\sqrt{3}}{10\sqrt{3}}$ $= \frac{2}{5} - \frac{1}{5} = \frac{1}{5}$	<p>✓ $\frac{4\sqrt{3} - 2\sqrt{3}}{2.5\sqrt{3}}$ M</p> <p>✓ S CA</p> <p>✓ S CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ M</p> <p>✓ S CA</p> <p>✓ S CA</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 0 auto;"> AO: Only one mark / <i>Slegs een punt</i> </div> <p style="text-align: right;">(3)</p>

<p>3.2</p> $\log_2(x + 62) - \log_2 x = 5$ $\log_2\left(\frac{x + 62}{x}\right) = 5$ $2^5 = \frac{x + 62}{x}$ $32 = \frac{x + 62}{x} \Rightarrow 32x = x + 62$ $x = 2$ <p style="text-align: center;">OR/OF</p> $\log_2(x + 62) - \log_2 x = 5$ $\log_2(x + 62) = \log_2 x + \log_2 32$ $\log_2(x + 62) = \log_2(32x)$ $x + 62 = 32x$ $x = 2$ <p style="text-align: center;">OR/OF</p> $\log_2(x + 62) - \log_2 x = 5$ $\log_2 \frac{x + 62}{2^5} = \log_2 x$ $\frac{x + 62}{32} = x$ $32x = x + 62$ $x = 2$ <p style="text-align: center;">OR/OF</p> $\log_2(x + 62) - \log_2 x = 5$ $\frac{\log(x + 62)}{\log 2} - \frac{\log x}{\log 2} = 5$ $\log(x + 62) - \log x = 5 \log 2$ $\log \frac{x + 62}{x} = \log 2^5$ $\frac{x + 62}{x} = 32 \Rightarrow x + 62 = 32x$ $x = 2$ <p style="text-align: center;">OR/OF</p> $\log_2(x + 62) - \log_2 x = 5$ $\log_2(x + 62) - \log_2 x - \log_2 32 = 0$ $\log_2 \frac{x + 62}{x(32)} = 0$ $\frac{x + 62}{x(32)} = 1$ $31x = 62 \therefore x = 2$	<p>✓log property/log-eienskape M</p> <p>✓exponential form/ eksponensiële vorm M</p> <p>✓S CA</p> <p>✓value of/waarde van x CA</p> <p style="text-align: center;">OR/OF</p> <p>✓log property/ log-eienskap e M</p> <p>✓apply log property pas log-eienskap toe M</p> <p>✓S CA</p> <p>✓value of/waarde van x CA</p> <p style="text-align: center;">OR/OF</p> <p>✓log property/ log-eienskap M</p> <p>✓log property's log-eienskap M</p> <p>✓S CA</p> <p>✓value of/waarde van x CA</p> <p style="text-align: center;">OR/OF</p> <p>✓log property/ log-eienskap M</p> <p>✓log property/log-eienskap M</p> <p>✓S CA</p> <p>✓value of/waarde van x CA</p> <p style="text-align: center;">OR/OF</p> <p>✓log property / log-eienskap M</p> <p>✓S CA</p> <p>✓value of/waarde van x CA</p> <p style="text-align: center;">OR/OF</p> <p>✓log₂32 M</p> <p>✓log property / log-eienskap M</p> <p>✓S CA</p> <p>✓value of/waarde van x CA</p>
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AO: only one mark / slegs een punt

(4)

<p>3.3</p>	$z = -\sqrt{2} + \sqrt{2}i$ $ z = r = \sqrt{x^2 + y^2}$ $= \sqrt{(-\sqrt{2})^2 + (\sqrt{2})^2} = \sqrt{4}$ $= 2$ $\theta = \tan^{-1}\left(\frac{\sqrt{2}}{\sqrt{2}}\right)$ <p>OR any other trig. ratio to find θ <i>OF enige ander trig verh, of θ te bepaal</i></p> $= 45^\circ \quad \text{OR/OF} \quad \frac{\pi}{4}$ $\theta = 180^\circ - 45^\circ = 135^\circ \quad \text{OR/OF} \quad \frac{3\pi}{4}$ $\therefore z = 2\text{cis}(135^\circ) \quad \text{OR/OF} \quad z = 2\text{cis}\left(\frac{3\pi}{4}\right)$	<p>✓ calculating the modulus/ <i>bereken die modulus</i> M ✓ S CA</p> <p>✓ $\theta = \tan^{-1}\left(\frac{\sqrt{2}}{\sqrt{2}}\right)$ M</p> <p>✓ ref. angle/<i>verwysingshoek</i> CA</p> <p>✓ correct quadrant/ <i>korrekte kwadrant</i> CA</p> <p>✓ polar form/<i>polêre vorm</i> CA</p> <p>Accept/Aanvaar: $z = 2[\cos 135^\circ + i \sin 135^\circ]$ $z = 2\left[\cos \frac{3\pi}{4} + i \sin \frac{3\pi}{4}\right]$</p> <p style="text-align: right;">(6)</p>
<p>3.4</p>	$p + qi = (2 - 3i)^2$ $= 4 - 12i + 9i^2$ $= 4 - 12i + 9(-1)$ $= -5 - 12i$ $\therefore p = -5 \text{ and/en } q = -12$	<p>✓ expansion/<i>uitbreiding</i> ✓ $i^2 = -1$ A</p> <p>✓ $p = -5$ ✓ $q = -12$ CA</p> <p style="text-align: right;">(4) [21]</p>

QUESTION/VRAAG 4

	Q4.1.2: Penalty of ONE mark if intercepts are not given as coordinates (refer also to Question 7.1)} V 4.1.2: Penaliseer EEN punt indien afsnitte nie as ko-ordinate gegee (verwys ook na Vraag 7.1)	
4.1.1	$x = 0$ and/en $y = -1$	✓ vertical asymptote/ <i>vertikale asimptoot</i> A ✓ horizontal asymptote/ <i>horisontale asimptoot</i> A (2)
4.1.2	$h(x) = -\frac{6}{x} - 1$ $0 = -\frac{6}{x} - 1$ $\therefore x = -6$ $(-6; 0)$	✓ $0 = -\frac{6}{x} - 1$ M ✓ -6 A (2)
4.1.3		✓ horizontal asymptote/ <i>horisontale asimptoot</i> CA from /van Q/V 4.1.1 <u>g:</u> ✓ intercept/afsnit $(0; 0)$ A ✓ shape/vorm A <u>h:</u> ✓ x-intercept/-afsnit CA ✓ both curves/beide kromme A (5)
4.1.4	$g(-2) = 2^{-(-2)} - 1 = 3$ <p style="text-align: center;">OR/OF</p> $3 = 2^{-x} - 1$ $2^2 = 2^{-x}$ $\therefore x = -2$	✓SF A <p style="text-align: center;">OR/OF</p> ✓SF A (1)
4.1.5	$y > -1$ OR/OF $y \in (-1; \infty)$	✓ $y > -1$ A (1)
4.1.6	$x \neq 0$ OR/OF $x \in (-\infty; 0) \cup (0; \infty)$ OR/OF $x \in \mathbb{R}; x \neq 0$ OR/OF $x < 0$ or $x > 0$ OR/OF $x \in \mathbb{R} - \{0\}$	✓ A (1)

4.2.1	M(1;0)	✓ (1;0) A (1)
4.2.2	MT = 8 MR = g(1) = $\sqrt{36 - (1)^2} = \sqrt{35}$ ∴ TR = MT - MR = 8 - $\sqrt{35}$	✓ length of/lengte van MT A ✓ length of/lengte van MK SF ✓ length of/lengte van TR CA (3)
4.2.3	g(0) = $\sqrt{36 - (0)^2} = 6$ ∴ L(0;6) OR/OF r = $\sqrt{36} = 6$ L(0;6)	✓SF A OR/OF ✓ calculating radius/bereken radius A (1)
4.2.4	f(x) = y = a(x + p) ² + q y = a(x - 1) ² + 8 6 = a(0 - 1) ² + 8 a = -2 ∴ f(x) = -2(x - 1) ² + 8 = -2(x ² - 2x + 1) + 8 = -2x ² + 4x + 6 = -2(x ² - 2x - 3) ∴ f(x) = -2(x + 1)(x - 3)	✓SF (1; 8) ✓a = -2 CA ✓S CA ✓common factor/ gemene faktor M (4)
4.2.5	∴ K(-1; 0)	✓coordinates of/ koördinate van K A (1)
4.2.6	x ∈ (-1; 0) OR/OF -1 < x < 0	CA from /van Q4.2.5 ✓critical values/ kritiese waardes CA OR/OF ✓notation/notasie CA (2) [24]

QUESTION/VRAAG 5

<p>5.1</p>	$i_{eff} = \left(1 + \frac{i_{nom}}{m}\right)^m - 1$ $0,067 = \left(1 + \frac{i_{nom}}{12}\right)^{12} - 1$ $1,067 = \left(1 + \frac{i_{nom}}{12}\right)^{12}$ $\sqrt[12]{1,067} = \left(1 + \frac{i_{nom}}{12}\right)$ $i_{nom} = 12\left(\sqrt[12]{1,067} - 1\right) \approx 0,065$ <p>∴ nominal interest rate is/nominale rentekoers is 6,5 %</p>	<p>✓ SF</p> <p>✓ $\sqrt[12]{1,067} = \left(1 + \frac{i_{nom}}{12}\right)$ CA</p> <p>✓ $12\left(\sqrt[12]{1,067} - 1\right) = i_{nom}$ CA</p> <p>✓ 6,5 % CA (Accept/aanvaar 0,065)</p> <p style="text-align: right;">(4)</p>
<p>5.2.1</p>	<p>R120 000</p>	<p>✓ R120 000 A</p> <p style="text-align: right;">(1)</p>
<p>5.2.2</p>	<p>Reducing balance method/<i>verminderde balans-metode</i> :</p> $A = P(1 - i)^n$ $120\,000 = 240\,000(1 - 16\%)^n$ $0,5 = (0,84)^n$ $n = \log_{0,84} 0,5$ <p>∴ $n \approx 3,98$</p> <p>∴ it will take 4 years/<i>dit sal 4 jaar neem</i></p> <p>OR/OF</p> <p>Straight line - method/<i>Re guitlynmetode</i> :</p> $A = P(1 - i \times n)$ $120\,000 = 240\,000(1 - 16\% \times n)$ $-0,5 = (-16\% n)$ $n = \frac{-0,5}{-16\%}$ <p>∴ $n \approx 3,125$</p> <p>∴ it will take 3 years/<i>dit sal 3 jaar neem</i></p>	<p>✓ SF</p> <p>✓ $0,5 = (0,84)^n$ CA</p> <p>✓ logs/ logs CA</p> <p>✓ $n = 3,98$ CA</p> <p>✓ R</p> <p style="text-align: center;">OR/OF</p> <p>✓ SF</p> <p>✓ $-0,5 = (-16\% n)$ CA</p> <p>✓ making n the subject/ <i>maak n de onderwerp</i> CA</p> <p>✓ $n = 3,125$ CA</p> <p>✓ R</p> <p style="text-align: right;">(5)</p>

<p>5.3</p>	<p>For the first 4 years/<i>Vir eerste 4 jaar</i> :</p> $A = P(1 + i)^n = 40000 \left(1 + \frac{11,2\%}{4} \right)^{4 \times 4}$ <p>$\therefore A \approx R\ 62\ 222,83\dots$</p> <p>For the last 3 years/<i>Vir laaste 3 jaar</i> :</p> $A = 62\ 222,83\dots(1 + 13\%)^3$ $\approx R\ 89\ 781,15$ <p style="text-align: center;">OR/OF</p> $A = P(1 + i)^n \cdot (1 + i)^n$ $= 40000 \left(1 + \frac{11,2\%}{4} \right)^{4 \times 4} \cdot (1 + 13\%)^3$ $\approx R\ 89\ 781,15$	<p>✓ value of/<i>waarde van i and/en n</i> A</p> <p>✓ SF CA</p> <p>✓ 62 222, 83... CA</p> <p>✓ SF CA</p> <p>✓ 89 781 ,15 CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ $A = P(1 + i)^n \cdot (1 + i)^n$ M</p> <p>✓ value of/<i>waarde van i and/en n</i> A</p> <p>✓ value of/<i>waarde va i and/en n</i> A</p> <p>✓ SF CA</p> <p>✓ 89 781 ,15 CA</p> <p style="text-align: right;">(5) [15]</p>
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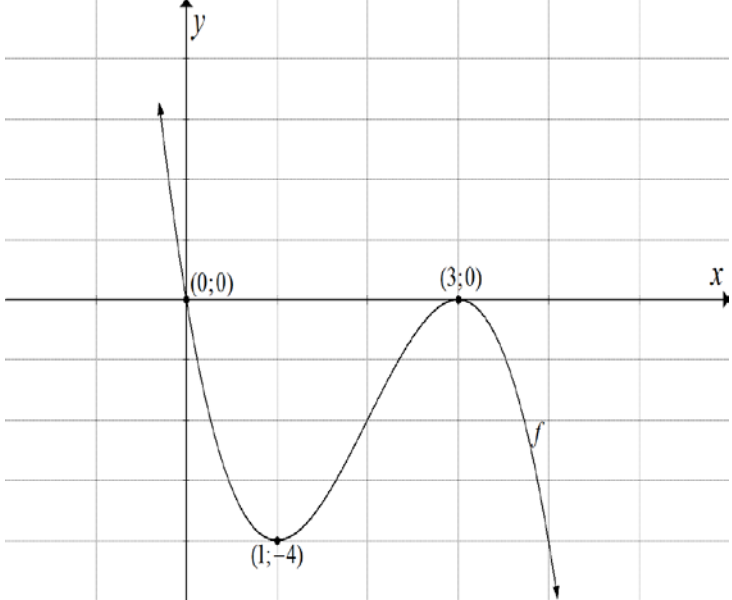
QUESTION/VRAAG 6

<p>6.1</p>	$f(x) = 7x - 2$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{[7(x+h) - 2] - (7x - 2)}{h}$ $= \lim_{h \rightarrow 0} \frac{7x + 7h - 2 - 7x + 2}{h}$ $= \lim_{h \rightarrow 0} \frac{7h}{h}$ $= \lim_{h \rightarrow 0} (7)$ $\therefore f'(x) = 7$	<p>✓ definition/definisie A</p> <p>✓ SF</p> <p>✓ S CA</p> <p>✓ S CA</p> <p>✓ 7 CA</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>AO only one mark/slegs een punt</p> </div> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Penalty of one mark incorrect notation</p> <p><i>Penaliseer een punt indien notasie foutief is.</i></p> </div> <p style="text-align: right;">(5)</p>
<p>Penalty of only one mark only once for incorrect notation (last step) for sub-questions 6.2.1, 6.2.2 & 6.2.3 <i>Penaliseer slegs een punt vir foutiewe notasie (laaste stap) vir subvrae 6.2.1, 6.2.2 & 6.2.3</i></p>		
<p>6.2.1</p>	$\frac{d}{dx}(\pi^2) = 0$	<p>✓ 0 A</p> <p style="text-align: right;">(1)</p>
<p>6.2.2</p>	$D_x(x^4 - \sqrt[3]{x})$ $= D_x\left(x^4 - x^{\frac{1}{3}}\right)$ $= 4x^3 - \frac{1}{3}x^{-\frac{2}{3}}$	<p>✓ power form/magvorm</p> <p>✓ $4x^3$ A</p> <p>✓ $\frac{1}{3}x^{-\frac{2}{3}}$ CA</p> <p style="text-align: right;">(3)</p>
<p>6.2.3</p>	$y = \frac{x^5 + 2}{x^2}$ $= x^3 + 2x^{-2}$ $\frac{dy}{dx} = 3x^2 - 4x^{-3}$	<p>✓ x^3 A</p> <p>✓ $2x^{-2}$ A</p> <p>✓ $3x^2$ CA</p> <p>✓ $-4x^{-3}$ CA</p> <p style="text-align: right;">(4)</p>

6.3.1	$p(x) = x^3 + 1$ $p(2) = (2)^3 + 1 = k$ $\therefore k = 9$	✓ S ✓ 9 A (2)
6.3.2	$p(x) = x^3 + 1$ $p'(x) = 3x^2$	✓ derivative/afgeleide A (1)
6.3.3	$p'(x) = 3x^2$ $m = 3(2)^2$ $= 12$ $y - 9 = 12(x - 2) \quad \text{OR / OF} \quad 9 = 12(2) + c$ $y = 12x - 24 + 9 \quad \quad \quad c = -15$ $\therefore y = 12x - 15 \quad \quad \quad \therefore y = 12x - 15$ <p style="text-align: center;">OR/OF</p> $y - 12x + 15 = 0$	✓ gradient/gradient CA ✓ SF CA ✓ $y = 12x - 15$ CA (3) [19]

QUESTION/VRAAG 7

	Q7.1: Penalty of ONE mark if intercepts not given as coordinates (refer also to Question 4)\	
	V 7.1 : Penaliseer EEN punt indien afsnitte nie as koördinate gegee (verwys ook na Vraag 4)	
7.1	$f(x) = -x(x-3)(x-3)$ $x=0$ and/en $x=3$ $(0;0)$ and/en $(3;0)$	$\checkmark (0; 0)$ A $\checkmark (3; 0)$ A
7.2	$f(x) = -x(x-3)(x-3)$ $y = f(0) = -(0)(0-3)(0-3) = 0$	$\checkmark 0$ A
7.3	$f(x) = -x(x-3)(x-3)$ $= -x(x^2 - 6x + 9)$ OR/OF $= (-x^2 + 3x)(x-3)$ OR/OF $= (x^2 - 3x)(-x + 3)$ $\therefore f(x) = -x^3 + 6x^2 - 9x$	$\checkmark\checkmark -x(x^2 - 6x + 9)$ M A OR/OF $\checkmark\checkmark (-x^2 + 3x)(x-3)$ M A OR/OF $\checkmark\checkmark (x^2 - 3x)(-x + 3)$ M A
7.4	$f(x) = -x^3 + 6x^2 - 9x$ $f'(x) = -3x^2 + 12x - 9$ $-3x^2 + 12x - 9 = 0$ $x^2 - 4x + 3 = 0$ $(x-3)(x-1) = 0$ $\therefore x = 3$ or/of $x = 1$ $f(1) = -(1)^3 + 6(1)^2 - 9(1) = -4$ $(3;0)$ and/en $(1; -4)$	\checkmark derivative/afgeleide M \checkmark equating derivative to 0/ <i>stel afgeleide gelyk aan 0</i> M \checkmark factors/formula/faktore CA \checkmark both values of /beide waardes <i>van x</i> CA \checkmark both values of /beide waardes <i>van y</i> CA <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> AO: Full marks/Volpunte </div> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> Coordinates of one turning point only: two marks/ <i>Koördinate van een draaipunt slegs: twee punte</i> </div>

7.5		<ul style="list-style-type: none"> ✓ correct shape/korrekte vorm A ✓ y-intercept/-afsnit CA ✓ x-intercepts/-afsnitte CA ✓ turning points/draaipunte CA <p style="text-align: right;">(4)</p>
7.6	$1 < x < 3$ OR/OF $x \in (1;3)$	<ul style="list-style-type: none"> ✓ critical values/ kritieke waardes : 1 and/en 3 CA ✓ notation/notasie <p style="text-align: right;">(2) [16]</p>

QUESTION/VRAAG 8

8.1.1	$V = l \times b \times h$ $= 3x(1,5)(1-x)$ <p style="text-align: center;">OR/OF</p> $V = 4,5x - 4,5x^2$	✓ formula/formule ✓✓ SF (3)
8.1.2	$V = 4,5x - 4,5x^2$ $\frac{dV}{dx} = 4,5 - 9x$ $4,5 - 9x = 0$ $9x = 4,5$ $\therefore x = 0,5$ <p style="text-align: center;">OR/OF</p> $x = -\frac{b}{2a}$ $= -\frac{4,5}{2(-4,5)}$ $= 0,5$	CA from Question/ Vraag 8.1.1 ✓ derivative/afgeleide M ✓ equating to 0/ stel gelyk aan 0 M ✓ value of/waarde van x CA <p style="text-align: center;">OR/OF</p> ✓ using a formula/gebruik 'n formule ✓ S ✓ value of/waarde van x CA (3)
8.2.1	$v(0) = 8 + 4(0) - (0)^2 \text{ m/s} = 8 \text{ m/s}$ $\therefore \text{the initial velocity of the car/}$ $\text{die aanvanklike snelheid van die motor } 8 \text{ m/s}$	✓ 8 m/s A NPU (1)
8.2.2	$v(t) = 8 + 4t - t^2$ $v(0,2) = 8 + 4(0,2) - (0,2)^2 \text{ m/s}$ $= 8,76 \text{ m/s}$ $\therefore \text{the velocity of the car when 0,2 seconds will be } 8,76 \text{ m/s}$ $\text{die snelheid van die motor wanneer 0,2 sekondes sal } 8,76 \text{ m/s wees}$	✓ S ✓ 8,76 m/s A NPU (2)
8.2.3	$v(t) = 8 + 4t - t^2$ $v'(t) = 4 - 2t$ $v'(1,2) = 4 - 2(1,2) \text{ m/s}^2$ $= 1,6 \text{ m/s}^2$	✓ 4 A ✓ -2t A ✓ SF into a derivative/ in 'n afgeleide CA ✓ 1,6 m/s ² CA NPU (4) [13]

QUESTION/VRAAG 9

	Penalty of one mark once only if the constant in Questions 9.1.1 & 9.1.2 is omitted/ <i>Penalising met slegs een punt, indien konstante in Vrae 9.1.1 & 9.1.2 weggelaat is.</i>	
9.1.1	$\int -\frac{6}{x} dx$ $= -6 \int \frac{1}{x} dx$ $= -6 \ln x + C \text{ OR } \ln \frac{1}{x^6} + C \text{ OR } -6 \log_e x + C$	<p>✓ $-6 \ln x$ OR/OF $\ln \frac{1}{x^6}$ OR/OF $-6 \log_e x$</p> <p>✓ C</p> <p style="text-align: right;">(2)</p>
9.1.2	$\int (x - 1)^2 dx$ $= \int (x^2 - 2x + 1) dx$ $= \frac{x^3}{3} - x^2 + x + C$	<p>✓ product / product M</p> <p>✓ $\frac{x^3}{3}$ CA</p> <p>✓ $-x^2$ CA</p> <p>✓ $x + C$ CA</p> <p style="text-align: right;">(4)</p>
9.2		<p>✓ Area notation using integrals/ <i>Area-notasie met gebruik van integrale</i> M</p> <p>✓ $\frac{x^3}{3}$ A</p> <p>✓ $3x$ A</p> <p>✓✓ SF CA</p> <p>✓ bounded area/ <i>begrensde oppervakke</i> CA NPU</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>AO: 3 marks/punte</p> </div> <p style="text-align: right;">(6) [12]</p>

TOTAL/TOTAAL: 150