



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE/
NASIONALE
SENIOR SERTIFIKAAT**

GRADE 12/GRAAD 12

TECHNICAL MATHEMATICS P1/TEGNIESE WISKUNDE VI

NOVEMBER 2019

MARKING GUIDELINES/NASIENRIGLYNE

MARKING CODES/NASIENKODES	
A	Accuracy/Akkuraatheid
AO	Answer only/Slegs antwoord
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 unit/Geen penalisering vir eenhede weggelaat nie
S	Simplification/Vereenvoudiging
F	Correct formula/Korrekte formule
SF	Substitution in correct formula/Vervanging in korrekte formule

MARKS/PUNTE: 150

**These marking guidelines consist of 24 pages.
Hierdie nasienriglyne bestaan uit 24 bladsye.**

NOTE:

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent accuracy to be applied as indicated on the marking guidelines.
- # Shows questions where Tolerance Range will be applied are Q1.3, Q3.2, Q5.2 and Q5.3.

LET WEL:

- Indien 'n kandidaat 'n vraag TWEE keer beantwoord, sien slegs die EERSTE poging na.
- Volgehoue akkuraatheid sal toegepas word soos op die nasienriglyne aangedui.
- # Toon vrae waar Toleransie Wydte (Verdraagsaamheids omvang) toegepas word is V1.3, V3.2, V5.2 en V5.3.

QUESTION/VRAAG 1

<p>1.1.1</p>	$p(x) = 2x^2 - \frac{8}{81}$ $= 2\left(x^2 - \frac{4}{81}\right)$ $= 2\left(x - \frac{2}{9}\right)\left(x + \frac{2}{9}\right)$ <p style="text-align: center;">OR/OF</p> $p(x) = \frac{162x^2 - 8}{81}$ $= \frac{2(81x^2 - 4)}{81}$ $= \frac{2(9x - 2)(9x + 2)}{81}$	<p>✓ common factor/gemene faktor A</p> <p>✓ both factors/beide faktore CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ common factor/gemene faktor A</p> <p>✓ both factors/beide faktore CA (2)</p>	
<p>1.1.2</p>	$p(x) = 2\left(x - \frac{2}{9}\right)\left(x + \frac{2}{9}\right) = 0$ <p>∴ $x = \frac{2}{9}$ or / of $x = -\frac{2}{9}$ OR/OF</p> <p>∴ $x = \pm \frac{2}{9}$ OR/OF $x \approx \pm 0,22$</p> <p style="text-align: center;">OR/OF</p> $x = \frac{-(0) \pm \sqrt{(0)^2 - 4(2)\left(-\frac{8}{81}\right)}}{2(2)}$ <p>∴ $x = \frac{2}{9}$ or / of $x = -\frac{2}{9}$ OR/OF</p> <p>∴ $x = \pm \frac{2}{9}$ OR/OF $x \approx \pm 0,22$</p>	<p>✓ both values of/beide waardes van x CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ both values of/beide waardes van x CA (1)</p>	

<p>1.2.1</p>	$(3x-5)(x+2) = -13$ $3x^2 + x - 10 + 13 = 0$ $3x^2 + x + 3 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(1) \pm \sqrt{(1)^2 - 4(3)(3)}}{2(3)}$ $x = \frac{-1 \pm \sqrt{-35}}{6}$ $x = \frac{-1 \pm \sqrt{35}i}{6} \quad \text{OR/OF} \quad x \approx \frac{-1 \pm 5,92i}{6}$ $x = -\frac{1}{6} + \frac{\sqrt{35}}{6}i \quad \text{or/of} \quad -\frac{1}{6} - \frac{\sqrt{35}}{6}i$ $x \approx -0,17 + 0,99i \quad \text{or/of} \quad x \approx -0,17 - 0,99i$ $x = -\frac{1}{6} \pm \frac{\sqrt{35}}{6}i \quad \text{OR/OF} \quad x \approx -0,17 \pm 0,99i$	<p>✓ standard form/<i>standaard vorm</i> A</p> <p>✓ SF CA</p> <p>✓ S CA</p> <p>✓ $\sqrt{-35} = \sqrt{35}i$ CA ✓ both <i>x-values/beide x-waardes</i> CA</p> <p style="text-align: right;">(5)</p>
<p>1.2.2</p>	$(4-x)(x+3) < 0 \quad \text{OR/OF} \quad (x-4)(x+3) > 0$ <p>CV: $x = -3$ and $x = 4$</p> $x < -3 \text{ or/of } x > 4 \quad \text{OR/OF}$ $x \in (-\infty; -3) \cup (4; \infty)$	<p>✓ both critical values/ <i>beide kritiese waardes</i> A</p> <p>✓ ✓ correct notation for each interval/<i>korrekte notasie vir elke interval</i> CA</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> Accept Number Line/ Aanvaar getallelyn </div> <div style="text-align: center; margin-top: 10px;"> </div> <p style="text-align: right;">(3)</p>

<p>1.3</p> $y = 3x - 8$ $x^2 - xy + y^2 = 39$ $x^2 - x(3x - 8) + (3x - 8)^2 = 39$ $x^2 - 3x^2 + 8x + 9x^2 - 48x + 64 - 39 = 0$ $7x^2 - 40x + 25 = 0$ $(x - 5)(7x - 5) = 0 \text{ OR/OF}$ $x = \frac{-(-40) \pm \sqrt{(40)^2 - 4(7)(25)}}{2(7)}$ $\therefore x = 5 \text{ or/of } x = \frac{5}{7} \text{ OR / OF } 0,71$ $y = 3(5) - 8 = 7 \text{ or/of } y = 3\left(\frac{5}{7}\right) - 8 = -\frac{41}{7}$ $\text{OR / OF } y \approx -5,86$ OR/OF $y = 3x - 8$ $x^2 - xy + y^2 = 39$ $x = \frac{y + 8}{3}$ $x^2 - xy + y^2 = 39$ $\left(\frac{y + 8}{3}\right)^2 - y\left(\frac{y + 8}{3}\right) + y^2 = 39$ $\frac{y^2 + 16y + 64}{9} - \frac{y^2}{3} - \frac{8y}{3} + y^2 = 39$ $y^2 + 16y + 64 - 3y^2 - 24y + 9y^2 = 351$ $7y^2 - 8y - 287 = 0$ $(y - 7)(7y + 41) = 0 \text{ OR/OF}$ $x = \frac{-(-40) \pm \sqrt{(40)^2 - 4(7)(25)}}{2(7)}$ $\therefore y = 7 \text{ or/of } y = -\frac{41}{7} \text{ OR / OF } y \approx -5,86$ $x = \frac{7 + 8}{3} = 5 \text{ or/of } x = \frac{-\frac{41}{7} + 8}{3} = \frac{5}{7}$ $\text{OR / OF } x \approx 0,71$	$\checkmark \text{ substitution/vervanging} \quad \text{A}$ $\checkmark \text{ S} \quad \text{CA}$ $\checkmark \text{ standard form/standaard vorm} \quad \text{CA}$ $\checkmark \text{ factors or formula/faktore} \quad \text{CA}$ $\checkmark \text{ both x-values/beide x-waardes} \quad \text{CA}$ $\checkmark \text{ both y-values/beide y-waardes} \quad \text{CA}$ OR/OF $\checkmark \text{ substitution/vervanging} \quad \text{A}$ $\checkmark \text{ S} \quad \text{CA}$ $\checkmark \text{ standard form/standaard vorm} \quad \text{CA}$ $\checkmark \text{ factors/ formula/faktore} \quad \text{CA}$ $\checkmark \text{ both y-values/beide y-waardes} \quad \text{CA}$ $\checkmark \text{ both x-values/beide x-waardes} \quad \text{CA}$	<p>(6)</p>
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<p>1.4.1</p>	$V = I \times Z$ $I = \frac{V}{Z} \quad \text{OR/OF} \quad I = VZ^{-1}$	<p>✓ dividing by/deel deur Z A (1)</p>
<p>1.4.2</p>	$I = \frac{V}{Z}$ $= \frac{7i}{3-i}$ $= \frac{7i}{3-i} \times \frac{3+i}{3+i}$ $= \frac{21i + 7i^2}{9 - i^2}$ $= \frac{21i + 7(-1)}{9 - (-1)}$ $= \frac{-7 + 21i}{10} \quad \text{OR/OF} \quad -0,7 + 2,1i \quad \text{OR/OF}$ $\frac{-7}{10} + \frac{21i}{10}$	<p>✓ substitution/vervanging CA</p> <p>✓ M multiply by/ vermenigvuldig met $\frac{3+i}{3+i}$ A</p> <p>✓ S CA</p> <p>✓ value of/waarde van i^2 A</p> <p>✓ value of current/waarde van stroom CA</p> <div style="border: 1px solid black; width: 100px; height: 20px; margin: 10px auto; text-align: center;">NPU</div> <p>(5)</p>
<p>1.5</p>	$\begin{array}{r} 1 \quad 0 \quad 1_2 \\ \times \quad 1 \quad 1_2 \\ \hline 1 \quad 0 \quad 1_2 \\ + 1 \quad 0 \quad 1 \quad 0_2 \\ \hline 1 \quad 1 \quad 1 \quad 1_2 \end{array}$ <p style="text-align: center;">OR/OF</p> <p>$101_2 \times 11_2 = 5 \times 3 = 15 \quad \text{OR/OF} \quad 1111_2$</p>	<p>✓ M A</p> <p>✓ 1111_2 A</p> <p style="text-align: center;">OR/OF</p> <p>✓ both/beide 5 and/en 3 A</p> <p>✓ $1111_2 \quad \text{OR/OF} \quad 15$ A</p> <div style="border: 1px solid black; width: 200px; height: 20px; margin: 10px auto; text-align: center;">AO: Full marks/Volpunte</div> <p>(2) [25]</p>

QUESTION/VRAAG 2

2.1.1	$G = \sqrt{\frac{p+1}{2p-1}}$ $2p-1=0$ $\therefore p = \frac{1}{2}$	$\checkmark p = \frac{1}{2}$ <p style="text-align: right;">A (1)</p>	
2.1.2	$p+1=0$ $p=-1$	$\checkmark p = -1$ <p style="text-align: right;">A (1)</p>	
2.2	$x^2 - k + 4 = 5x$ $x^2 - 5x - k + 4 = 0$ $b^2 - 4ac \geq 0$ $(-5)^2 - 4(1)(-k + 4) \geq 0$ $25 + 4k - 16 \geq 0$ $4k + 9 \geq 0$ $k \geq -\frac{9}{4}$	\checkmark standard form/ <i>standard vorm</i> A \checkmark the discriminant/ <i>die diskriminant</i> ≥ 0 A \checkmark SF A \checkmark S CA \checkmark values of/ <i>waardes van</i> k CA (5) [7]	

QUESTION/VRAAG 3

<p>3.1</p>	$\left(-2 \sqrt[4]{a^3}\right)^8$ $= (-2)^8 \left(a^3\right)^{\frac{8}{4}}$ $= 256 a^6$	<p>✓ 256 A ✓ a^6 A (2)</p>
<p>3.2</p> <p>#</p>	$\log_2(3x-2) + \log_2 0,5 = 3$ $\log_2(3x-2) + \log_2 2^{-1} = 3$ $\log_2(3x-2) - 1 = 3$ $\log_2(3x-2) = 4$ $(3x-2) = 2^4$ $3x-2 = 16$ $x = 6$ <p style="text-align: center;">OR/OF</p> $\log_2(3x-2) + \log_2 0,5 = 3$ $\log_2(0,5)(3x-2) = 3$ $(0,5)(3x-2) = 2^3$ $(0,5)(3x-2) = 8$ $3x-2 = 16$ $x = 6$ <p style="text-align: center;">OR/OF</p> $\log_2(3x-2) + \log_2 0,5 = 3$ $\log_2(3x-2) = 3 - \log_2 0,5$ $\log_2(3x-2) = 3 \log_2 2 - \log_2 0,5$ $\log_2(3x-2) = \log_2 8 - \log_2 0,5$ $\log_2(3x-2) = \log_2 \left(\frac{8}{0,5}\right)$ $3x-2 = 16$ $x = 6$ <p style="text-align: center;">OR/OF</p>	<p>✓ $\log_2 0,5 = -1$ A ✓ S CA ✓ exponential form/eksponent vorm CA</p> <p>✓ correct value/korrekte waarde CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ log property/eienskap A ✓ exponential form/eksponent vorm A</p> <p>✓ S CA ✓ correct value/korrekte waarde CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ log property/eienskap A ✓ log property/eienskap A</p> <p>✓ S CA ✓ correct value/korrekte waarde CA</p> <p style="text-align: center;">OR/OF</p>

$\log_2 0,5(3x - 2) = \log_2 2^3$ $\log_2 0,5(3x - 2) = \log_2 8$ $0,5(3x - 2) = 8$ $3x - 2 = 16$ $x = 6$ <p style="text-align: center;">OR/OF</p> $\log_2(3x - 2) + \log_2 0,5 = 3$ $\log_2(3x - 2) - \log_2 2 = 3$ $\log_2 \frac{(3x - 2)}{2} = 3$ $\frac{(3x - 2)}{2} = 2^3$ $3x - 2 = 16$ $x = 6$	<p style="text-align: center;">OR/OF</p> <p>✓ log property/eienskap A</p> <p>✓ log property/eienskap A</p> <p>✓ S CA</p> <p>✓ correct value/korrekte waarde CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ log property/eienskap A</p> <p>✓ log property/eienskap A</p> <p>✓ S CA</p> <p>✓ correct value/korrekte waarde CA</p> <p>(4)</p>
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<p>3.3</p>	$\log \sqrt{0,6}$ $= \log (0,6)^{\frac{1}{2}} \text{ OR/OF } \log (0,3 \times 2)^{\frac{1}{2}} \text{ OR/OF } \log (0,2 \times 3)^{\frac{1}{2}}$ $= \frac{1}{2} \log \left(\frac{6}{10} \right) \text{ OR/OF } \frac{1}{2} \log (0,3 \times 2) \text{ OR/OF } \frac{1}{2} \log (0,2 \times 3)$ $= \frac{1}{2} \log \left(\frac{3 \times 2}{10} \right)$ $= \frac{1}{2} (\log 3 + \log 2 - \log 10)$ $= \frac{1}{2} (b + a - 1) \text{ OR/OF } \frac{1}{2} b + \frac{1}{2} a - \frac{1}{2}$ <p style="text-align: center;">OR/OF</p> $\log \sqrt{0,6} = \log \sqrt{\frac{3}{5}}$ $= \frac{1}{2} \log 3 - \frac{1}{2} \log 5$ $\therefore \log \sqrt{0,6} = \frac{1}{2} \log 3 + \frac{1}{2} (\log 2 - \log 10)$ $= \frac{1}{2} (b + a - 1) \text{ OR/OF } \frac{1}{2} b + \frac{1}{2} a - \frac{1}{2}$	<p>✓ exp. form/eksp. vorm A</p> <p>✓ conversion of / herleiding van 0,6 A</p> <p>✓ log property/eienskap A</p> <p>✓ log 10=1 CA</p> <p>✓ substitution/vervanging CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ conversion of / herleiding van 0,6 A</p> <p>✓ log property/eienskap A</p> <p>✓ conversion of log 5 A</p> <p>✓ log 10=1 CA</p> <p>✓ substitution/vervanging CA</p> <p style="text-align: right;">(5)</p>	
<p>3.4.1</p>	$V = 2(\cos 240^\circ + i \sin 240^\circ)$ <p style="text-align: center;">OR/OF</p> $V = 2\left(\cos \frac{3}{4} \pi + i \sin \frac{3}{4} \pi\right)$	<p>✓ value of/ waarde van V A</p> <p style="text-align: right;">(1)</p>	

<p>3.4.2</p>	<p>$V = 2(\cos 240^\circ + i \sin 240^\circ)$ OR/OF</p> <p>$V = 2\left(\cos \frac{3}{4}\pi + i \sin \frac{3}{4}\pi\right)$</p> <p>$V = 2\left(-\frac{1}{2} - \frac{\sqrt{3}}{2}i\right)$</p> <p>$\therefore V = -1 - \sqrt{3}i$</p> <p style="text-align: center;">OR/OF</p> <p>$\theta = 60^\circ$ [ref angle/ verw. hoek]</p> <p>$\tan 60^\circ = \sqrt{3} = \frac{-\sqrt{3}}{-1}$</p> <p>$V = -1 - \sqrt{3}i$</p>	<p>CA from/vanaf Q/V3.4.1</p> <p>✓ value of/waarde van $\cos 240^\circ$ OR/OF $\cos \frac{3}{4}\pi$ CA</p> <p>✓ value of/waarde van $\sin 240^\circ$ OR/OF $\sin \frac{3}{4}\pi$ CA</p> <p>✓ V in rect. form/ in regh.vorm CA</p> <p style="text-align: center;">OR/OF</p> <p>✓ ref. angle/verw. hoek A</p> <p>✓ tan ratio/verhouding A</p> <p>✓ V in rect form/ in regh.vorm CA</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>AO: Full marks/Volpunte</p> </div> <p style="text-align: right;">(3)</p>	
<p>3.5</p>	<p>$m + ni = 2(6 - 4i) - (-7i)$</p> <p>$= 12 - 8i + 7i = 12 - i$</p> <p>$m = 12$ and/ en $n = -1$</p> <p style="text-align: center;">OR/OF</p> <p>$m = 2(6) = 12$ and/ en $n = 2(-4) - (-7) = -1$</p>	<p>✓ value of m/ waarde van m A</p> <p>✓ value of n/ waarde van n A</p> <p style="text-align: center;">OR/OF</p> <p>✓ value of m/ Waarde van m A</p> <p>✓ value of n/ Waarde van n A</p> <p style="text-align: right;">(2)</p> <div style="border: 1px solid black; padding: 5px; text-align: center;"> <p>AO: Full marks/Volpunte</p> </div> <p style="text-align: right;">[17]</p>	

QUESTION/VRAAG 4

4.1.1	$(x-5)(x+3)=0$ $x=5$ or/of $x=-3$ OR/OF (5;0) and/en (-3;0)	✓ both values of/ beide waardes van x A (1)	
4.1.2	$q(x) = \frac{12}{x} - 2$ $\frac{12}{x} - 2 = 0$ $2x = 12$ $x = 6$ OR/OF (6;0) OR/OF $q(x) = \frac{a}{x} + p$ $x = \frac{a}{-p}$ [$q(x) = 0$] $= \frac{12}{-(-2)}$ $= 6$ OR/OF (6;0)	✓ $y = 0$ A ✓ x - value/waarde CA OR/OF ✓ $y = 0$ A ✓ x - value/waarde CA (2)	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> AO: Full marks /Volpunte </div>

<p>4.1.3</p>	$x = \frac{5-3}{2} = 1$ $k(1) = (1-5)(1+3) = -16$ $\therefore \text{TP/DP } (1; -16)$ <p style="text-align: center;">OR / OF</p> $(x-5)(x+3) = 0$ $x^2 - 2x - 15 = 0$ $x = \frac{-b}{2a} = \frac{-(-2)}{2(1)} = 1$ $k(1) = (1)^2 - 2(1) - 15 = -16 \quad \text{OR / OF}$ $y = \frac{4ac - b^2}{4a} = \frac{4(1)(-15) - (-2)^2}{4(1)} = -16$ $\therefore \text{TP/DP } (1; -16)$ <p style="text-align: center;">OR / OF</p> $k'(x) = 2x - 2$ $2x - 2 = 0$ $\therefore x = 1$ $k(1) = (1)^2 - 2(1) - 15 = -16$ $\therefore \text{TP/DP } (1; -16)$	<p>✓ M CA ✓ $x = 1$ A ✓ $y = -16$ CA</p> <p style="text-align: center;">OR / OF</p> <p>✓ M CA ✓ $x = 1$ A</p> <p>✓ $y = -16$ A</p> <p style="text-align: center;">OR / OF</p> <p>✓ M A ✓ $x = 1$ A ✓ $y = -16$ CA (3)</p>
<p>4.1.4</p>	$y = -2$ $x = 0$	<p>✓ $y = -2$ A ✓ $x = 0$ A (2)</p>
<p>4.1.5</p>		<p><u>Graph / grafiek k:</u> ✓ x-intercepts/afsnitte CA ✓ y-intercept/afsnitte CA ✓ shape/vorm A ✓ turning point/draaipunt CA</p> <p><u>Graph / grafiek q:</u> ✓ hor. asympt/asimpt A ✓ x-intercepts/afsnit CA ✓ shape/vorm A (7)</p>

4.2.1	$d = -4$	✓ value of/waarde van d A <div style="border: 1px solid black; padding: 5px; width: fit-content;"> Accept/ Aanvaar $y = -4$ </div> CA (1)	
4.2.2	$h(x) = a^x - 4$ $-2 = a^{-1} - 4$ $a = \frac{1}{2}$ $\therefore h(x) = \left(\frac{1}{2}\right)^x - 4$	✓ substitution/vervanging CA ✓ correct value of/ korrekte waarde van a CA (2)	
4.2.3	$h(0) = a^0 - 4$ OR/OF $h(0) = (0,5)^0 - 4$ $T(0; -3)$	✓ $x = 0$ A ✓ $y = -3$ CA (2)	
4.2.4	$y \in [-3; 0]$ OR/OF $-3 \leq y \leq 0$	✓ range/ waardeversm(terrein) CA (1)	
4.2.5	$p(x) = -\sqrt{9 - x^2}$ $\therefore w(x) = \sqrt{9 - x^2}$ OR/OF $\therefore w(x) = \sqrt{r^2 - x^2}$	✓ equation of/ vergelyking van p CA ✓ equation of/ vergelyking van w CA (2) <div style="border: 1px solid black; padding: 5px; width: fit-content;"> AO: Full marks/Volpunte </div>	
4.2.6	$0 < x \leq 3$ OR/OF $x \in (0; 3]$	✓ endpoints/eindpunte A ✓ correct notation/ korrekte notasie A (2) [25]	

QUESTION/VRAAG 5

5.1.1	R11 000	✓ new value/ nuwe waarde A (1)	
5.1.2	$A = R5\ 500 \quad P = R11\ 000 \quad n = 5 \quad i = ?$ $A = P(1 - in)$ $R5\ 500 = R11\ 000(1 - i \times (5))$ $i = \frac{\frac{R5\ 500}{R11\ 000} - 1}{-5}$ $= 0,10$ $= 10\%$	✓SF CA ✓ making i the subject/ maak i die onderwerp CA ✓ interest rate/ rentekoers CA <div style="border: 1px solid black; padding: 2px; display: inline-block;">AO: Full marks/Volpunte</div> (3)	
5.2 #	$A = P(1 + i)^n$ $273 = 200(1 + 3,5\%)^n$ $\frac{273}{200} = (1,035)^n$ $n = \frac{\log \frac{273}{200}}{\log (1,035)}$ OR / OF $n = \log_{1,035} \frac{273}{200}$ $\approx 9,04$ years/ jaar \therefore the year 2018 / die jaar 2018 <p style="text-align: center;">OR/OF</p> $A_1 = R200(1 + 3,5\%)^1 \approx R207$ $A_2 = R200(1 + 3,5\%)^2 \approx R214,25$. . $A_9 = R200(1 + 3,5\%)^9 \approx R272,58$ $A_{10} = R200(1 + 3,5\%)^{10} \approx R282,12$ \therefore the year 2018 / die jaar 2018	✓SF A ✓S CA ✓ log property/ eienskap CA ✓ value of/waarde van n CA ✓ correct year/ korrekte jaar CA <p style="text-align: center;">OR/OF</p> ✓SF A ✓S CA ✓SF A ✓S CA ✓ correct year/ korrekte jaar CA <div style="border: 1px solid black; padding: 2px; display: inline-block;">NOTE/ NOTA: Accept/Aanvaar 2019</div> <div style="border: 1px solid black; padding: 2px; display: inline-block;">NPR</div> (5)	

<p>5.3 #</p>	<p>Value of the investment after initial deposit/ <i>waarde van die belegging na die aanvangs deposito:</i></p> $A = P(1+i)^n$ $= R293\ 000 \left(1 + \frac{6,7\%}{4}\right)^{2 \times 4}$ $\approx R\ 334\ 642,4791$ <p>$R334\ 642,4791 + R95\ 000 = R429\ 642,4791$</p> <p>Value of the investment after adding/<i>waarde van die belegging na byvoeging van R95 000 :</i></p> $= 429\ 642,4791 \left(1 + \frac{6,7\%}{4}\right)^{2 \times 4}$ $\approx R490\ 705,2026$ <p>Value of the investment after change in interest rate/<i>waarde van die belegging na verandering van rentekoers :</i></p> $= R490\ 705,2026 \left(1 + \frac{7,5\%}{12}\right)^{4 \times 12}$ $\approx R661\ 764,62 > R660\ 580$ <p><i>∴ Yes she has accumulated sufficient funds./Ja, sy het genoeg fondse geakkumuleer</i></p> <p style="text-align: center;">OR/OF</p> $A = \left[293\ 000 \left(1 + \frac{6,7\%}{4}\right)^{2 \times 4} + 95\ 000 \right]$ $\times \left(1 + \frac{6,7\%}{4}\right)^{2 \times 4} \left(1 + \frac{7,5\%}{12}\right)^{4 \times 12}$ $\approx R\ 661\ 764,62 > R\ 660\ 580$ <p><i>∴ Yes she has accumulated sufficient funds./Ja, sy het genoeg fondse geakkumuleer</i></p> <p style="text-align: center;">OR/OF</p>	<p>✓SF A</p> <p>✓S CA</p> <p>✓S CA</p> <p>✓SF A</p> <p>✓S CA</p> <p>✓ value of <i>i</i> and <i>n</i>/ <i>waarde van i en n</i> A</p> <p>✓S CA</p> <p>✓ conclusion/ <i>gevolgtrekking</i> CA</p> <p style="text-align: center;">OR/OF</p> <p>✓M A</p> <p>✓✓SF A</p> <p>✓ value of <i>i</i> and <i>n</i>/ <i>waarde van i en n</i> A</p> <p>✓ adding/byvoeging R95 000 A</p> <p>✓ change of rate/ <i>verandering van koers</i> A</p> <p>✓S CA</p> <p>✓ conclusion/ <i>gevolgtrekking</i> CA</p> <p style="text-align: center;">OR/OF</p>
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$A = R293\,000 \left(1 + \frac{6,7\%}{4}\right)^{4 \times 4} \cdot \left(1 + \frac{7,5\%}{12}\right)^{4 \times 12}$ $+ R95\,000 \left(1 + \frac{6,7\%}{4}\right)^{2 \times 4} \left(1 + \frac{7,5\%}{12}\right)^{4 \times 12}$ <p>$\approx R\,661\,764,62 > R\,660\,580$</p> <p>$\therefore$ Yes she has accumulated sufficient funds./ <i>Ja, sy het genoeg fondse geakkumuleer</i></p>	<p>✓ M A ✓✓ SF A ✓ value of i and n/ waarde van i en n A ✓ adding/byvoeging R95 000 with interests/met rente A ✓ change of rate/ verandering van koers A ✓ S CA ✓ conclusion/ gevolgtrekking CA</p>
<p style="text-align: center;">OR/OF</p> $P = R660\,580 \left(1 + \frac{6,7\%}{4}\right)^{-4 \times 2} \cdot \left(1 + \frac{7,5\%}{12}\right)^{-4 \times 12}$ $- R95\,000 \left(1 + \frac{6,7\%}{4}\right)^{2 \times 4} \left(1 + \frac{7,5\%}{12}\right)^{4 \times 12}$ <p>$\approx R\,282\,547,91 < R\,293\,000$</p> <p><i>Yes she has accumulated sufficient funds./</i> <i>Ja, sy het genoeg fondse geakkumuleer</i></p>	<p style="text-align: center;">OR/OF</p> <p>✓ M A ✓✓ SF A ✓ value of i and n/ waarde van i en n A ✓ subtracting R95 000 with interests A ✓ change of rate/ verandering van koers A ✓ S CA ✓ conclusion/ gevolgtrekking CA</p>
<p style="text-align: center;">OR/OF</p> $1 + i_{eff} = \left(1 + \frac{i_{nom}}{m}\right)^m = \left(1 + \frac{6,7\%}{4}\right)^4 \approx 0,068\dots$ <p>2 years/jaar: $A = P(1+i)^n = R293\,000(1+0,068\dots)^2 + R95\,000$ $\approx R\,429\,642,48$</p> <p>4th year/jaar: $A = R429\,642,48(1+0,068\dots)^2 \approx R490\,705,20$</p> <p>5 – 8 years/jaar: $A = R490\,705,20 \left(1 + \frac{7,5\%}{12}\right)^{4 \times 12} \approx R661\,764,62 > R660\,580$</p> <p>$\therefore$ Yes she has accumulated sufficient funds./ <i>Ja, sy het genoeg fondse geakkumuleer</i></p> <p style="text-align: center;">OR/OF</p>	<p style="text-align: center;">OR/OF</p> <p>✓ SF A ✓ S CA</p> <p>✓ SF CA ✓ S CA</p> <p>✓ S CA</p> <p>✓ value of i and n/ waarde van i en n A ✓ S CA</p>

$A = P(1+i)^n$ $A_0 = R293\,000 \left(1 + \frac{0,067}{4}\right)^{4 \times 4}$ $\approx R\,382\,203,3749$ $A_1 = R382\,203,3749 \left(1 + \frac{0,075}{12}\right)^{4 \times 12}$ $\approx R\,515\,439,147$ $A_2 = R95\,000 \left(1 + \frac{0,067}{4}\right)^{2 \times 4}$ $\approx R\,108\,501,8277$ $A_3 = R108\,501,8277 \left(1 + \frac{0,075}{12}\right)^{4 \times 12}$ $\approx R\,146\,325,4728$ $A_1 + A_3 \approx R661\,764,62 > R660580$ <p>∴ Yes she has accumulated sufficient funds./ Ja, sy het genoeg fondse geakkumuleer</p>	<p>✓ conclusion/ gevolgtrekking CA OR/OF</p> <p>✓SF A</p> <p>✓ S CA</p> <p>✓SF A</p> <p>✓ S CA</p> <p>✓ S CA</p> <p>✓ value of <i>i</i> and <i>n</i>/ waarde van <i>i</i> en <i>n</i> A</p> <p>✓ S CA</p>	
<p>NOTE/NOTA: 1) Max. 4 marks if Simple Interest is used./ <i>Maks 4 punte indien enkelvoudige rente</i> 2) Max. 2 marks if any Depreciation is used./ <i>Maks 2 punte indien enkelvoudige rente</i></p>		<p>(8) [17]</p>

QUESTION/VRAAG 6

<p>6.1</p>	$f(x) = 5 - \frac{1}{2}x$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{\left[\left(5 - \frac{1}{2}(x+h) \right) \right] - \left(5 - \frac{1}{2}x \right)}{h}$ $= \lim_{h \rightarrow 0} \frac{5 - \frac{1}{2}x - \frac{1}{2}h - 5 + \frac{1}{2}x}{h}$ $= \lim_{h \rightarrow 0} \frac{-\frac{1}{2}h}{h}$ $= \lim_{h \rightarrow 0} \left(-\frac{1}{2} \right)$ $\therefore f'(x) = -\frac{1}{2}$	<p>✓ definition/definisie A</p> <p>✓ SF A</p> <p>✓ S CA</p> <p>✓ $\lim_{h \rightarrow 0} \frac{-\frac{1}{2}h}{h}$ CA</p> <p>✓ $-\frac{1}{2}$ CA</p> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>AO: ONLY 1 mark/ SLEGS 1 punt</p> </div> <div style="border: 1px solid black; padding: 5px; margin: 5px 0;"> <p>Penalty of 1 mark for incorrect notation/ penaliseer 1 punte vir verkeerde notasie</p> </div> <p style="text-align: right;">(5)</p>
<p>No penalty for notation in the remaining questions/ Geen penaliseering vir notasie in die</p>		
<p>6.2.1</p>	$f(x) = a^3 - 0,5x^3 - x^{-1}$ $f'(x) = 0 - 1,5x^2 + x^{-2} \text{ OR / OF } -1,5x^2 + x^{-2}$	<p>✓ derivative of/ afgeleide van a^3 A</p> <p>✓ $-1,5x^2$ A</p> <p>✓ x^{-2} A</p> <p style="text-align: right;">(3)</p>
<p>6.2.2</p>	$D_x \left[x \left(\sqrt{x} + 2 \right) \right]$ $= D_x \left[x \left(x^{\frac{1}{2}} + 2 \right) \right]$ $= D_x \left[x^{\frac{3}{2}} + 2x \right]$ $= \frac{3}{2}x^{\frac{1}{2}} + 2$	<p>✓ $x^{\frac{1}{2}}$ A</p> <p>✓ product/produk CA</p> <p>✓ $\frac{3}{2}x^{\frac{1}{2}}$ CA</p> <p>✓ 2 CA</p> <p style="text-align: right;">(4)</p>

6.3.1	$xy + 2x^3 = 7x^6$ $y = \frac{7x^6 - 2x^3}{x}$ OR / OF $y = 7x^5 - 2x^2$	✓M A ✓ making y the subject/ <i>maak y die onderwerp</i> A (2)
6.3.2	$y = 7x^5 - 2x^2$ $\frac{dy}{dx} = 35x^4 - 4x$	✓ $35x^4$ CA ✓ $- 4x$ CA (2)
6.4.1	$P(300) = 0,8(300)^2 - 200(300)$ $= R12\ 000$	✓ profit/wins A (1)
6.4.2	$P(x) = 0,8x^2 - 200x$ $0,8x^2 - 200x = 0$ $x(0,8x - 200) = 0$ $x = 0$ or $x = 250$ $\therefore 250$ light bulbs/ <i>gloeilampe</i> OR/OF $0,8x^2 - 200x = 0$ $0,8x^2 = 200x$ $x = \frac{200x}{0,8x}$; $x \neq 0$ $\therefore x = 250$ $\therefore 250$ light bulbs/ <i>gloeilampe</i>	✓ factors/ <i>faktore</i> M A ✓ correct value of/ <i>korrekte waarde van x</i> CA OR/OF ✓ isolating/ <i>isoleer x</i> M A ✓ correct value of/ <i>korrekte waarde van x</i> CA <div style="border: 1px solid black; padding: 2px; display: inline-block;"> AO: Full marks/<i>Volpunte</i> </div> (2)
6.4.3	$P(x) = 0,8x^2 - 200x$ $P'(x) = 1,6x - 200$ $P'(200) = 1,6(200) - 200$ $= 120$ bulbs per day / <i>gloeilampe per dag</i>	✓ derivative/ <i>afgeleide</i> A ✓ substitution/ <i>vervanging</i> CA ✓ rate/ <i>tempo</i> CA <div style="border: 1px solid black; padding: 2px; display: inline-block;"> NPU </div> (3) [22]

	$f(x) = x^3 + bx^2 + cx + d$ $f(x) = x^3 + bx^2 + cx + 18$ $0 = (3)^3 + b(3)^2 + c(3) + 18$ $0 = 45 + 9b + 3c$ $c = -15 - 3b$ $f'(x) = 3x^2 + 2bx + c$ $f'(3) = 3(3)^2 + 2b(3) + c$ $c = -27 - 6b$ $-15 - 3b = -27 - 6b$ $\therefore b = -4$ $c = -27 - 6(-4)$ $\therefore c = -3$	<p>✓ $d = 18$ A</p> <p>✓ S A</p> <p>✓ S A</p> <p>(3)</p>
7.3	$f(x) = x^3 - 4x^2 - 3x + 18$ $f'(x) = 3x^2 - 8x - 3 = 0$ $3x^2 - 8x - 3 = 0$ $(3x + 1)(x - 3) = 0 \text{ OR / OF } x = \frac{-(-8) \pm \sqrt{(-8)^2 - 4(3)(-3)}}{2(3)}$ $x = -\frac{1}{3} \text{ or/of } x \neq 3$ $y = f\left(-\frac{1}{3}\right) = \left(-\frac{1}{3}\right)^3 - 4\left(-\frac{1}{3}\right)^2 - 3\left(-\frac{1}{3}\right) + 18 = \frac{500}{27}$ $\therefore R\left(-\frac{1}{3}; \frac{500}{27}\right) \text{ OR / OF } R(-0,33; 18,52)$	<p>✓ $f'(x)$ CA</p> <p>✓ $f'(x) = 0$ CA</p> <p>✓ factors/formula/faktore/form CA</p> <p>✓ correct value of/korrekte waarde van x CA</p> <p>✓ R coordinates/koördinate CA</p> <p>(5)</p>
7.4.1	$y = \frac{500}{27} \text{ OR / OF } y \approx 18,52$	<p>✓ equation/vergeliking CA</p> <p>(1)</p>
7.4.2	$x > -2 \text{ OR / OF } x \in (-2; \infty)$	<p>✓ correct inequality/korrekte ongelykheid A</p> <p>(1)</p>
7.4.3	$-\frac{1}{3} < x < 3 \text{ OR / OF } x \in \left(-\frac{1}{3}; 3\right)$	<p>✓ critical values/kritiese waardes CA</p> <p>✓ correct notation/korrekte notasie CA</p> <p>(2)</p> <p>[15]</p>

QUESTION/VRAAG 8

8.1	$h = (66 - 2x - x) \text{ cm}$ $= (66 - 3x) \text{ cm}$	✓ height/hoogte A (1) <div style="border: 1px solid black; padding: 2px; display: inline-block;">NPU</div>
8.2	$V(\text{in cm}^3) = \pi r^2 h + \frac{1}{2} \left(\frac{4}{3} \pi r^3 \right)$ $= \pi x^2 (66 - 3x) + \frac{1}{2} \left(\frac{4}{3} \pi x^3 \right)$ $= 66\pi x^2 - 3\pi x^3 + \frac{2}{3} \pi x^3$ $= 66\pi x^2 - \frac{7}{3} \pi x^3$	✓ F A ✓ SF CA ✓ S CA <div style="border: 1px solid black; padding: 2px; display: inline-block;">NPU</div> (3)
8.3	$V(\text{in cm}^3) = 66\pi x^2 - \frac{7}{3} \pi x^3$ $\frac{dV}{dx} = -7\pi x^2 + 132\pi x$ $0 = -7\pi x^2 + 132\pi x$ $0 = -\pi x(7x - 132) \text{ OR / OF } x = \frac{-(132\pi) \pm \sqrt{(132\pi)^2 - 4(-7\pi)(0)}}{2(-7\pi)}$ $-\pi x = 0 \text{ or/of } x = \frac{132}{7}$ $x \neq 0$ $\therefore x = \frac{132}{7}$	✓ derivative/afgeleide CA ✓ equating $f'(x)$ to/stel gelyk aan 0 A ✓ factors/ formula faktore/form CA ✓ correct value of/ korrekte waarde van x CA (4)
8.4	$V(\text{in cm}^3) = 66\pi x^2 - \frac{7}{3} \pi x^3$ $= 66\pi \left(\frac{132}{7} \right)^2 - \frac{7}{3} \pi \left(\frac{132}{7} \right)^3$ $\approx 24\,576,74 \text{ OR/OF } 7823,02 \pi$	✓ SF CA ✓ max/maks volume CA <div style="border: 1px solid black; padding: 2px; display: inline-block;">NPR</div> (2) [10]

QUESTION/VRAAG 9

<p>9.1.1</p>	$\int m x^p dx$ $= m \left(\frac{x^{p+1}}{p+1} \right) + C \quad p \neq -1$ <p style="text-align: center;">OR/OF</p> $= \frac{m x^{p+1}}{p+1} + C \quad p \neq -1$	$\checkmark m \left(\frac{x^{p+1}}{p+1} \right) \quad \mathbf{A}$ $\checkmark C \quad \mathbf{A}$ <p style="text-align: center;">OR/OF</p> $\checkmark \frac{m x^{p+1}}{p+1} \quad \mathbf{A}$ $\checkmark C \quad \mathbf{A}$ <p style="text-align: right;">(2)</p>
<p>9.1.2</p>	$\int \left(\frac{x^{-3} + x^2}{x^{-1}} - 2 \right) dx$ $= \int (x^{-2} + x^3 - 2x^0) dx$ $= -x^{-1} + \frac{x^4}{4} - 2x^1 + C$	$\checkmark \mathbf{S} \quad \mathbf{A}$ $\checkmark -1x^{-1} \quad \mathbf{CA}$ $\checkmark \frac{x^4}{4} \quad \mathbf{CA}$ $\checkmark -2x^1 + C \quad \mathbf{CA}$ <p style="text-align: right;">(4)</p>

<p>9.2</p>	$A = \int_{1,4}^{3,5} \left(-\frac{4}{x} \right) dx$ $= [-4 \ln x]_{1,4}^{3,5}$ $= [-4 \ln(3,5)] - [-4 \ln(1,4)]$ $\approx -3,67$ <p>$\therefore 3,67$ square units <i>vierkante eenhede</i></p> <p style="text-align: center;">OR/OF</p> $A = - \int_{1,4}^{3,5} \left(-\frac{4}{x} \right) dx$ $= -[-4 \ln x]_{1,4}^{3,5}$ $= [4 \ln(3,5)] - [4 \ln(1,4)]$ $\approx 3,67$ <p>$\therefore 3,67$ square units/ <i>vierkante eenhede</i></p> <p style="text-align: center;">OR/OF</p> $A = \int_{1,4}^{3,5} \left[0 - \left(-\frac{4}{x} \right) \right] dx$ $= \int_{1,4}^{3,5} 0 dx + \int_{1,4}^{3,5} \left(\frac{4}{x} \right) dx$ $= [4 \ln x]_{1,4}^{3,5}$ $= [4 \ln(3,5)] - [4 \ln(1,4)]$ $\approx 3,67$ <p>$\therefore 3,67$ square units/ <i>vierkante eenhede</i></p>	<ul style="list-style-type: none"> ✓ area notation using integral/ <i>oppervlakte notasie deur gebruik van integrasie</i> A ✓ integral/integraal A ✓ substitution/<i>vervanging</i> CA ✓ substitution/<i>vervanging</i> CA ✓ S CA ✓ correct positive value of the bounded area/ <i>korrekte positiewe waarde van die begrensde oppervlakte</i> CA <p style="text-align: center;">OR/OF</p> <ul style="list-style-type: none"> ✓ area notation using integral/ <i>oppervlakte notasie deur gebruik van integrasie</i> A ✓ integral/integraal A ✓ substitution/<i>vervanging</i> CA ✓ substitution/<i>vervanging</i> CA ✓ S CA ✓ correct positive value of the bounded area/<i>korrekte positiewe waarde van die begrensde oppervlakte</i> CA ✓ correct positive value of the <p style="text-align: center;">OR/OF</p> <ul style="list-style-type: none"> ✓ area notation using integral/ <i>oppervlakte notasie deur gebruik van integrasie</i> A ✓ integral/integraal A ✓ substitution/<i>vervanging</i> CA ✓ substitution/<i>vervanging</i> CA ✓ S CA ✓ correct positive value of the bounded area/<i>korrekte positiewe waarde van die begrensde oppervlakte</i> CA <div style="border: 1px solid black; width: fit-content; margin: 10px auto; padding: 5px;"> <p>NPR & NPU</p> </div> <p style="text-align: right;">(6) [12]</p>
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TOTAL/TOTAAL: 150