



## 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 VI**

**2021**

**MARKING GUIDELINES/NASIENRIGLYNE**

**MARKS/PUNTE: 150**

<b>Marking Codes/Nasienkodes</b>	
<b>A</b>	Accuracy/Akkuraatheid
<b>CA</b>	Consistent Accuracy/Volgehoue Akkuraatheid
<b>M</b>	Method/Metode
<b>R</b>	Rounding/Afronding
<b>NPR</b>	No Penalty for Rounding/Geen Penaliserings vir Afronding
<b>NPU</b>	No Penalty for Units omitted/Geen Penaliseering vir Eenhede Weggelaat
<b>S</b>	Simplification/Vereenvoudiging
<b>SF</b>	Substitution in Correct Formula/Vervanging in Korrekte Formule
<b>AO</b>	Answer only/Slegs antwoord

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

<b>QUESTION/VRAAG 1</b>			
1.1.1	$(3-x)(x+1)=0$ $x=3 \text{ or / of } x=1$ <p style="text-align: center;"><b>OR/OF</b></p> $x^2 - 2x - 3 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-2) \pm \sqrt{(-2)^2 - 4(1)(-3)}}{2(1)}$ $x=3 \text{ or / of } x=-1$	$\checkmark x=3$ $\checkmark x=-1$ <p style="text-align: center;"><b>OR/OF</b></p> $\checkmark x=3$ $\checkmark x=-1$	<p style="text-align: right;"><b>A</b></p> <p style="text-align: right;"><b>A</b></p> <p style="text-align: right;"><b>(2)</b></p>
1.1.2	$2x^2 = 3x + 7$ $2x^2 - 3x - 7 = 0 \quad \text{OR/ OF} \quad -2x^2 + 3x + 7 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-3) \pm \sqrt{(-3)^2 - 4(2)(-7)}}{2(2)} = \frac{3 \pm \sqrt{65}}{4}$ $x \approx 2,77 \text{ or / of } x \approx -1,27$	$\checkmark \text{ standard form/ standaardvorm}$ $\checkmark \text{ SF}$ $\checkmark \text{ positive } x \text{ value/ postiewe waarde}$ $\checkmark \text{ negative } x \text{ value/ negatiewe waarde}$ <div style="border: 1px solid black; padding: 5px; margin-top: 10px;"> <p><b>AO: Full marks/Volpunte</b> <b>NPR</b></p> </div>	<p style="text-align: right;"><b>A</b></p> <p style="text-align: right;"><b>CA</b></p> <p style="text-align: right;"><b>CA</b></p> <p style="text-align: right;"><b>CA</b></p> <p style="text-align: right;"><b>(4)</b></p>

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

<p>1.3.1</p>	$F = \frac{K Q_1 Q_2}{r^2}$ $F \cdot r^2 = K Q_1 Q_2$ $r^2 = \frac{K Q_1 Q_2}{F}$ $r = \sqrt{\frac{K Q_1 Q_2}{F}}$	<p>✓ transposing/ oordra <math>r^2</math>      <b>A</b></p> <p>✓ <math>r</math> subject/ onderwerp      <b>CA</b></p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p><b>AO: Full marks /Volpunte</b></p> </div> <p style="text-align: right;">(2)</p>
<p>1.3.2</p>	$r = \sqrt{\frac{K Q_1 Q_2}{F}}$ $r = \sqrt{\frac{(9 \times 10^9)(0,5 \times 10^{-6})(0,2 \times 10^{-6})}{2,25 \times 10^{-4}}}$ $r = 2 \text{ m}$ <p style="text-align: center;"><b>OR/OF</b></p> $F = \frac{K Q_1 Q_2}{r^2}$ $2,25 \times 10^{-4} = \frac{(9 \times 10^9)(0,5 \times 10^{-6})(0,2 \times 10^{-6})}{r^2}$ $r = \sqrt{\frac{(9 \times 10^9)(0,5 \times 10^{-6})(0,2 \times 10^{-6})}{2,25 \times 10^{-4}}}$ $r = 2 \text{ m}$	<p>✓ <b>SF</b>      <b>CA</b></p> <p>✓ value of/waarde van <math>r</math>      <b>CA</b></p> <p style="text-align: center;"><b>OR/OF</b></p> <p>✓ <b>SF</b>      <b>A</b></p> <p>✓ value of/waarde van <math>r</math>      <b>CA</b></p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p><b>AO: Full marks/ Volpunte</b> NPU</p> </div> <p style="text-align: right;">(2)</p>
<p>1.4</p>	$\begin{array}{r} 1101_2 + 111_2 \\ 1101_2 \\ + 111_2 \\ \hline 10100_2 \end{array}$ <p style="text-align: center;"><b>OR/OF</b></p> $13 + 7 = 20$ $20 = 10100_2$	<p>✓✓ <math>10100_2</math>      <b>A</b></p> <p style="text-align: center;"><b>OR/OF</b></p> <p>✓ 20      <b>A</b></p> <p>✓ <math>10100_2</math>      <b>CA</b></p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p><b>AO: Full marks/ Volpunte</b></p> </div> <p style="text-align: right;">(2)</p> <p style="text-align: right;"><b>[20]</b></p>

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

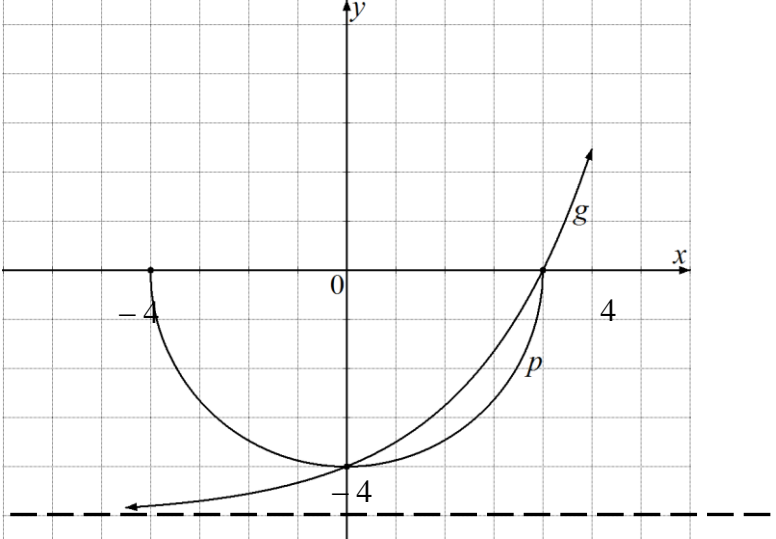
QUESTION/VRAAG 3		
3.1.1	$\sqrt{16a^6}$ $= \sqrt{(4^2) \cdot (a^6)} \quad \text{OR /OF} \quad (2^4 a^6)^{\frac{1}{2}}$ $= 4a^3$	<p>✓ 4 ✓ <math>a^3</math></p> <p>A A (2)</p>
3.1.2	$\sqrt{\log_2 32 + \log 100 + 9}$ $= \sqrt{5 \log_2 2 + \log 100 + 9}$ $= \sqrt{5 + 2 + 9}$ $= 4$	<p>✓ <math>5 \log_2 2</math></p> <p>✓ 2 ✓ S</p> <p>A CA</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 5px auto;">AO: 0 marks/punte</div> <p>(3)</p>
3.1.3	$(4\sqrt{5} + \sqrt{2})(\sqrt{2} - 4\sqrt{5})$ $= 4\sqrt{10} - 80 + 2 - 4\sqrt{10}$ $= -78$ <p style="text-align: center;"><b>OR/OF</b></p> $= -(4\sqrt{5} - \sqrt{2})(4\sqrt{5} + \sqrt{2})$ $= -80 + 2$ $= -78$	<p>✓ product/produk ✓ S</p> <p style="text-align: center;"><b>OR/OF</b></p> <p>✓ product/produk ✓ S</p> <div style="border: 1px solid black; padding: 2px; width: fit-content; margin: 5px auto;">AO: 0 marks/punte</div> <p>A CA A CA (2)</p>
3.2 #	$\log_3 x = 3 - \log_3(x+6)$ $\log_3 x + \log_3(x+6) = 3$ $\log_3(x^2 + 6x) = 3$ $x^2 + 6x = 3^3 \quad \text{OR/OF} \quad \log_3(x^2 + 6x) = 3 \log_3 3$ $x^2 + 6x = 27$ $x^2 + 6x - 27 = 0$ $(x + 9)(x - 3) = 0$ $x \neq -9 \quad \text{or / of} \quad x = 3$ <p style="text-align: center;"><b>OR/OF</b></p> $\log_3 x = 3 - \log_3(x+6)$ $\log_3 x = 3 \log_3 3 - \log_3(x+6)$ $\log_3 x = \log_3 27 - \log_3(x+6)$ $\log_3 x = \log_3 \frac{27}{(x+6)}$ $x = \frac{27}{x+6}$ $x^2 + 6x - 27 = 0$ $(x + 9)(x - 3) = 0$ $x \neq -9 \quad \text{or / of} \quad x = 3$	<p>✓ log property/log-eienskap</p> <p>✓ exponential form/ eksponensiële vorm</p> <p>✓ standard form/ standaardvorm</p> <p>✓ factors/formula/faktore/formule ✓ value of/waarde van <math>x</math> ✓ validity/geldigheid</p> <p style="text-align: center;"><b>OR/OF</b></p> <p>✓ log property/log-eienskap</p> <p>✓ log property/log-eienskap</p> <p>✓ standard form/ standaardvorm ✓ factors/formula/ faktore ✓ value of/ waarde van <math>x</math> ✓ restriction/ beperking</p> <p>A A CA CA CA A A CA CA CA CA (6)</p>

3.3.1	$z = 2 \left( \frac{1}{2} + 3i \right) - 7i = 1 + 6i - 7i$ $= 1 - 1i$	✓ substitution/vervanging $w$ <b>A</b> ✓ <b>S</b> <b>A</b> <div style="border: 1px solid black; padding: 2px; display: inline-block;"><b>AO: Full marks/ Volpunte</b></div> (2)
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 = $45^\circ$ $\theta = 360^\circ - 45^\circ = 315^\circ$ $\therefore z = \sqrt{2} \text{ cis } 315^\circ$	✓ modulus <b>CA from/vanaf Q/V 3.3.1</b> ✓ value of/waarde van $\tan \theta$ <b>CA from/vanaf Q/V 3.3.1</b> ✓ ref angle/verw. hoek <b>CA</b> ✓ angle in the correct quadrant/ hoek in die regte kwadrant <b>CA</b> ✓ polar form/polere vorm <b>CA</b> <div style="border: 1px solid black; padding: 2px; display: inline-block;"><b>AO: Full marks/ Volpunte</b></div> (5)
3.4	$a + b + ia - bi = 5 - 3i$ $a + b + (a - b)i = 5 - 3i$ $a + b = 5 \dots\dots\dots 1$ $a - b = -3 \dots\dots\dots 2$ Equat./ vergelyk. 1 + Equat./ vergelyk. 2 $a + b = 5$ $\frac{a - b = -3}{2a = 2} \quad \text{OR/OF} \quad a = 5 - b$ $\therefore a = 1 \quad (5 - b) - b = -3$ $\therefore b = 4 \quad -2b = -8$ $\quad \quad \quad \therefore b = 4$ $\quad \quad \quad a = 5 - 4$ $\quad \quad \quad \therefore a = 1$ <p style="text-align: center;"><b>OR/</b></p> $a + b - 5 = bi - ai - 3i$ $a + b - 5 = 0$ $-a + b - 3 = 0$ $(1) - (2): 2b - 8 = 0$ $2b = 8$ $b = 4$ $a + 4 - 5 = 0$ $a = 1$	✓ equation/ vergelyking <b>A</b> ✓ equation/ vergelyking <b>CA</b>  ✓ value of/waarde van $a$ <b>CA</b> ✓ value of/waarde van $b$ <b>CA</b>  <p style="text-align: center;"><b>OR/OF</b></p> ✓ equation/ vergelyking <b>A</b> ✓ equation/ vergelyking <b>CA</b>  ✓ value of/waarde van $b$ <b>CA</b>  ✓ value of/waarde van $a$ <b>CA</b> (4) <b>[24]</b>

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



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

<p>4.2.2</p>		<p><b>g:</b>                  ✓ all intercepts/alle afsnitte <b>CA</b>                  ✓ shape/ vorm <b>A</b>                  ✓ asymptote/asimptote <b>A</b></p> <p><b>p:</b>                  ✓ all intercepts/alle afsnitte <b>A</b>                  ✓ shape/vorm <b>A</b>  <b>(5)</b></p>
<p>4.2.3 (a)</p>	<p><math>-4 \leq y \leq 0</math>  <b>OR/OF</b>  <math>y \in [-4; 0]</math>  <b>OR/OF</b>  <math>-4 \leq y</math> and/ en <math>y \leq 0</math></p>	<p>✓ both endpoints/ beide eindpunte <b>CA</b>  <b>from Q/ vanaf V 4.2.1(b)</b>                  ✓ notation/notasie <b>A</b>  <b>(2)</b></p>
<p>4.2.3 (b)</p>	<p><math>m = \frac{0 - 4}{-4 - 0} = 1</math>  <math>y = mx + c</math> <b>OR/OF</b> <math>y - y_1 = m(x - x_1)</math>  <math>y = 1x + (-4)</math> <math>y - 0 = 1(x - (-4))</math>  <math>\therefore y = x - 4</math>  <b>OR/OF</b>  <math>\frac{x}{4} + \frac{y}{-4} = 1</math>  <math>x - y = -4</math>  <math>\therefore y = x - 4</math></p>	<p>✓ gradient/gradient <b>CA</b>                  ✓ equation/vergeliking <b>CA</b>  <b>OR/OF</b>                  ✓ <b>M</b>                  ✓ equation/vergeliking <b>CA</b>  <b>AO: Full marks/ Volpunte</b>  <b>(2)</b></p>
<p>4.2.3 (c)</p>	<p><math>0 &lt; x &lt; 4</math>  <b>OR/OF</b>  <math>x \in (0; 4)</math>  <b>OR/OF</b>  <math>0 &lt; x</math> and/ en <math>x &lt; 4</math></p>	<p>✓ both endpoints/beide eindpunte <b>CA</b>                  ✓ notation/notasie <b>CA</b>  <b>(2)</b></p>
<p>4.2.3 (d)</p>	<p><math>-4 &lt; x \leq 0</math>  <b>OR/OF</b>  <math>x \in (-4; 0]</math>  <b>OR/OF</b>  <math>-4 &lt; x</math> and/ en <math>x \leq 0</math></p>	<p>✓ both endpoints/ beide eindpunte <b>CA</b>                  ✓ notation/notasie <b>CA</b>  <b>(2)</b>  <b>[32]</b></p>

<b>QUESTION/VRAAG 5</b>			
<p>5.1</p>	$i_{eff} = \left(1 + \frac{i_n}{m}\right)^m - 1$ $8,5\% = \left(1 + \frac{i_n}{4}\right)^4 - 1$ $i = 4\left(\sqrt[4]{1,085} - 1\right)$ $\approx 0,0824$ <p>nominal interest rate / nominale rentekoers <math>\approx 8,24\%</math></p> <p style="text-align: center;"><b>OR/OF</b></p> $A = P\left(1 + \frac{i}{m}\right)^{n \times m}$ $108,50 = 100\left(1 + \frac{i}{4}\right)^{1 \times 4}$ $i = 4\left(\sqrt[4]{\frac{108,50}{100}} - 1\right) \approx 0,082417$ <p>nominal interest rate / nominale rentekoers <math>\approx 8,24\%</math></p>	<p>✓ formula <b>CA</b></p> <p>✓ <math>m = 4</math> <b>CA</b></p> <p>✓ rate/ koers <b>CA</b></p> <p style="text-align: center;"><b>OR/OF</b></p> <p>✓ formula <b>CA</b></p> <p>✓ <math>m = 4</math> <b>CA</b></p> <p>✓ rate/ koers <b>CA</b> (3)</p> <p><b>NPR</b></p>	
<p>5.2</p>	$A = P(1 - i)^n$ $152\,523 = P(1 - 0,11)^3$ $152\,523 = 0,704969P$ $P \approx R216\,354,19$	<p>✓ <b>SF</b> <b>A</b></p> <p>✓ <math>152\,523 = 0,704969P</math> <b>CA</b></p> <p>✓ value of/ waarde van P <b>CA</b></p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p><b>AO: Full marks/Volpunte</b></p> </div> <p style="text-align: right;">(3)</p> <p><b>NPR</b></p>	

5.3.1	$A_{\text{Martin}} = P(1 + in)$ $= 13\ 000(1 + 5 \times 0,058)$ $= R16\ 770,00$ <p style="text-align: center;"><b>OR/OF</b></p> $SI = P \times i \times n$ $= 13\ 000 \times 5,8\% \times 5 = R3\ 770$ $A_{\text{Martin}} = 13\ 000 + 3\ 770 = R16\ 770$	✓SF <span style="float: right;">A</span> ✓ answer/antwoord <span style="float: right;">CA</span>  <p style="text-align: center;"><b>OR/OF</b></p> ✓SF <span style="float: right;">A</span> ✓ answer/antwoord <span style="float: right;">(2)</span>  <div style="border: 1px solid black; padding: 5px; text-align: center;"> <b>AO: Full marks/ Volpunte</b> </div>
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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 <b>NOT</b> have enough/ <i>Hulle sal NIE genoeg hê nie</i>  <p style="text-align: center;"><b>OR/OF</b></p> $A_{\text{Nosizwe}} = P(1 + i)^n$ $= 8\ 000 \left(1 + \frac{0,0764}{12}\right)^{24}$ $= R9\ 316,222013$ New P = R9 316,222013 + R 5 000 = 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 <b>NOT</b> have enough/ <i>Hulle sal NIE genoeg hê nie</i>	$\checkmark \left(1 + \frac{0,0764}{12}\right)^{24}$ <span style="float: right;">A</span> ✓ R18 094,50 <span style="float: right;">A</span> ✓ calculating interest after adding R5000 at 8,12%/ <i>bereken rente na byvoeg van R5000 teen 8,12%</i> <span style="float: right;">M</span> ✓ R 34 864,50 <span style="float: right;">CA</span> ✓ conclusion/gevolgtrekking <span style="float: right;">CA</span> <p style="text-align: center;"><b>OR/OF</b></p> $\checkmark \left(1 + \frac{0,0764}{12}\right)^{24}$ <span style="float: right;">A</span>  ✓ calculating interest after adding R5000 at 8,12%/ <i>bereken rente na byvoeg van R5000 teen 8,12%</i> <span style="float: right;">M</span> ✓ R18 094,50 <span style="float: right;">CA</span> ✓ R 34 864,50 <span style="float: right;">CA</span> ✓ conclusion/gevolgtrekking <span style="float: right;">CA</span> <b>NPR</b>
<div style="border: 1px solid black; padding: 10px; margin: 10px auto; width: 80%;"> <p><b>If a candidate indicate only conclusion without calculation: 0 marks</b></p> <p><i>Indien 'n kandidaat net die gevolgtrekking sonder berekening gee: 0 punte</i></p> </div>		(5)  <b>[13]</b>

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

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

<b>QUESTION/VRAAG 7</b>		
7.1.1	B(0 ; - 5)	✓ Coordinates of/ <i>koördinate van</i> 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 / <i>is 'n faktor</i>	✓ SF ✓ 0 A A (2)
7.1.3	By inspection / <i>Deur inspeksie</i> $h(x) = (x^2 + 2x + 1)(x - 5)$ $h(x) = (x + 1)^2(x - 5)$ $\therefore x = -1$ or/of $x = 5$ $\therefore D(5 ; 0)$  <p style="text-align: center;"><b>OR/OF</b></p> $h(x) = (x + 1)(x^2 - 4x - 5)$ $h(x) = (x + 1)(x - 5)(x + 1)$ <i>x</i> -intercepts/ <i>afsnitte</i> ; $h(x) = 0$ $\therefore x = -1$ or/of $x = 5$ $\therefore D(5 ; 0)$  <p style="text-align: center;"><b>OR/OF</b></p> $0 = (x + 1)(x^2 - 4x - 5)$ $x = -1$ 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 / <i>kwadratties faktor</i> A ✓ Other intercepts/ <i>ander afsnitte</i> A ✓ Coordinates of/ <i>koördinate van</i> D CA  <p style="text-align: center;"><b>OR/OF</b></p> ✓ quadratic factor/ <i>kwadratties faktor</i> A ✓ Other factors / <i>ander faktore</i> A  ✓ Coord. of/ <i>koord. van</i> D CA  <p style="text-align: center;"><b>OR/OF</b></p> ✓ quadratic factor/ <i>kwadratties faktor</i> A  ✓ Other intercepts/ <i>ander afsnitte</i> A ✓ Coord. of / <i>koord. van</i> D CA <div style="border: 1px solid black; padding: 2px; display: inline-block;"><b>AO: Full marks/ Volpunte</b></div> (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/ <i>afgeleide</i> M ✓ equating derivative to 0/ <i>stel afgeleide gelyk aan 0</i> M  ✓ factors/ <i>formula/faktore/ formule</i> CA  ✓ $x = 3$ CA ✓ $y = -32$ CA (5)
7.2	$x < -1$ or/of $x > 3$  <p style="text-align: center;"><b>OR/OF</b></p> $x \in (-\infty; -1) \cup (3; \infty)$	✓ both crit. values/ <i>beide krit. waarde</i> CA ✓ notation/ <i>notasie</i> CA  <p style="text-align: center;"><b>OR/OF</b></p> ✓ both crit. values/ <i>beide krit. waarde</i> CA ✓ notation/ <i>notasie</i> CA (2)

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<b>QUESTION/VRAAG 8</b>			
8.1	$30 - 6t = 0$ $30 = 6t$ $t = 5 \text{ s}$	✓ $30 - 6t$ <b>A</b>  ✓ value of/waarde van $t$ <b>CA</b> <div style="border: 1px solid black; padding: 2px; display: inline-block;">NPU</div> (2)	
8.2.1	$s = 30t - 3t^2$ $\frac{ds}{dt} = 30 - 6t$ $= 30 - 6(0) \text{ m/s}$ $= 30 \times \frac{3600}{1000} \text{ km/h}$ $= 108 \text{ km/h}$	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <b>NO Penalty if correct unit omitted.</b>  <i>Geen penaliseering indien korrekte eenheid uitgelaat</i> </div> ✓ $t = 0$ <b>A</b>  ✓ $\times \frac{3600}{1000}$ <b>A</b>  ✓ <b>S</b> <b>CA</b> (3)	
8.2.2	$s = 30(5) - 3(5)^2 \text{ m}$ $= 75 \text{ m}$	✓ substitution/vervanging <b>A</b> ✓ distance/afstand <b>CA</b>  <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <b>AO: Full marks/ Volpunte</b>  <b>NPU</b> </div> (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	✓ reason/rede <b>CA</b>  ✓ conclusion/gevolgtrekking <b>CA</b> (2) <b>[9]</b>	



<b>QUESTION/VRAAG 9</b>		
9.1.1	$\int \left( x^{-2} + \frac{1}{x} \right) dx$ $= -x^{-1} + \ln x + C \text{ OR/OF } = -\frac{1}{x} + \ln x + C$	$\checkmark -x^{-1}$ or/of $-\frac{1}{x}$ <b>A</b> $\checkmark \ln x$ <b>A</b> $\checkmark C$ <b>A</b> (3)
9.1.2	$\int \left( x^{\frac{4}{3}} - 5x^4 \right) dx$ $= \frac{x^{\frac{4}{3}+1}}{\frac{4}{3}+1} - \frac{5x^5}{5} + C$ $= \frac{3x^{\frac{4}{3}+1}}{4} - x^5 + C$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p><b>No penalty if C omitted</b>  <b>Geen penaliseering indien</b>  <b>C weggelaat is</b></p> </div>	$\checkmark \frac{x^{\frac{4}{3}+1}}{\frac{4}{3}+1}$ OR/OF $\frac{3x^{\frac{4}{3}+1}}{4}$ <b>A</b> $\checkmark -\frac{5x^5}{5}$ OR/OF $-x^5$ <b>A</b> (2)
9.2	$A = - \int_{-1}^2 (2x^3 - 4) dx$ $= - \left( \frac{x^4}{2} - 4x \right) \Big _{-1}^2$ $= - \left[ \left( \frac{(2)^4}{2} - 4(2) \right) - \left( \frac{(-1)^4}{2} - 4(-1) \right) \right]$ <p><math>\therefore A = 4,5</math> square units/kwadraat eenhede</p> <p style="text-align: center;"><b>OR/OF</b></p> $A = \int_{-1}^2 (2x^3 - 4) dx$ $= \left( \frac{x^4}{2} - 4x \right) \Big _{-1}^2$ $= \left[ \frac{(2)^4}{2} - 4(2) \right] - \left[ \frac{(-1)^4}{2} - 4(-1) \right]$ $= -4,5$ <p><math>\therefore A = 4,5</math> square units /kwadraat eenhede</p>	$\checkmark$ Area notation using intergrals/ <i>Area-notasie met gebruik van integrale</i> <b>M</b> $\checkmark \frac{x^4}{2}$ <b>A</b> $\checkmark -4x$ <b>A</b> $\checkmark\checkmark$ <b>SF</b> <b>CA</b> $\checkmark$ bounded area/ <i>begrensde oppervaklte</i> <b>CA</b> <p style="text-align: center;"><b>OR/OF</b></p> $\checkmark$ Area notation using intergrals/ <i>Area-notasie met gebruik van integrale</i> <b>M</b> $\checkmark \frac{x^4}{2}$ <b>A</b> $\checkmark -4x$ <b>A</b> $\checkmark\checkmark$ <b>SF</b> <b>CA</b> $\checkmark -4,5$ <b>CA</b> $\checkmark$ bounded area/ <i>begrensde oppervaklte</i> <b>CA</b> (6) <b>[11]</b>
<b>TOTAL/ TOTAAL: 150</b>		