



# basic education

Department:  
Basic Education  
**REPUBLIC OF SOUTH AFRICA**

**SENIOR CERTIFICATE/*SENIOR SERTIFIKAAT***  
**NATIONAL SENIOR CERTIFICATE/*NATIONALE SENIOR SERTIFIKAAT***

**GRADE 12/*GRAAD 12***

**MATHEMATICS P1/*WISKUNDE VI***  
**NOVEMBER 2020**  
**MARKING GUIDELINES/*NASIENRIGLYNE***

**MARKS/*PUNTE*: 150**

**These 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 memorandum.

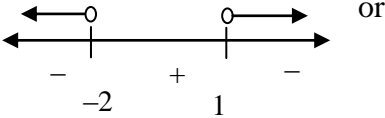
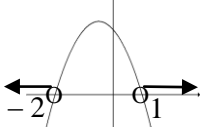
**LET WEL:**

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

**REMEMBER:** (A) next to the description of a tick implies accuracy mark

**ONTHOU:** (A) langs die beskrywing van 'n regmerk impliseer akkuraatheids-punt

**QUESTION/VRAAG 1**

1.1.1	$x^2 - 6x = 0$ $x(x - 6) = 0$ $x = 0 \text{ or } x = 6$	✓ common factor ✓ both answers (2)
1.1.2	$x^2 + 10x + 8 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-10 \pm \sqrt{10^2 - 4(1)(8)}}{2(1)}$ $= \frac{-10 \pm \sqrt{68}}{2}$ $x = -0,88 \text{ or } x = -9,12$	✓ substitution into the correct formula ✓ -0,88 ✓ -9,12 (3)
1.1.3	$(1 - x)(x + 2) < 0$ Critical values: $x = 1 \text{ or } x = -2$  or  $x < -2 \text{ or } x > 1$	✓ critical values ✓ correct method ✓ answer (3)
1.1.4	$\sqrt{x + 18} = x - 2$ $x + 18 = x^2 - 4x + 4$ $0 = x^2 - 5x - 14$ $(x - 7)(x + 2) = 0$ $x = 7 \text{ or } x = -2$	✓ squaring both sides (m) ✓ standard form ✓ factors ✓ both answers ✓ rejection of $x = -2$ (5)

<p>1.2</p>	$x + y = 3$ $y = 3 - x \dots\dots\dots (1)$ $2x^2 + 4xy - y = 15 \dots\dots\dots (2)$ <p>Substitute (1) into (2):</p> $2x^2 + 4x(3 - x) - (3 - x) = 15$ $2x^2 + 12x - 4x^2 - 3 + x - 15 = 0$ $-2x^2 + 13x - 18 = 0$ $2x^2 - 13x + 18 = 0$ $(2x - 9)(x - 2) = 0$ $x = \frac{9}{2} \text{ or } x = 2$ $y = -\frac{3}{2} \text{ or } y = 1$ <p><b>OR</b></p> $x + y = 3$ $x = 3 - y \dots\dots\dots (1)$ $2x^2 + 4xy - y = 15 \dots\dots\dots (2)$ <p>Substitute (1) into (2):</p> $2(3 - y)^2 + 4(3 - y)y - y = 15$ $2y^2 - 12y + 18 - 4y^2 + 12y - y - 15 = 0$ $-2y^2 - y + 3 = 0$ $2y^2 + y - 3 = 0$ $(2y + 3)(y - 1) = 0$ $y = -\frac{3}{2} \text{ or } y = 1$ $x = \frac{9}{2} \text{ or } x = 2$	<p>✓ y subject of the formula</p> <p>✓ substitution</p> <p>✓ standard form</p> <p>✓ factors</p> <p>✓ x-values</p> <p>✓ y-values</p> <p>(6)</p> <p><b>OR</b></p> <p>✓ x subject of the formula</p> <p>✓ substitution</p> <p>✓ standard form</p> <p>✓ factors</p> <p>✓ y-values</p> <p>✓ x-values</p> <p>(6)</p>
<p>1.3</p>	$n^{200} < 5^{300}$ $(n^2)^{100} < (5^3)^{100}$ $(n^2)^{100} < (125)^{100}$ $n^2 < 125$ <p>Maximum value of <math>n</math> is 11.</p> <p><b>OR</b></p> $200 \log n < 300 \log 5$ $n < 10^{\frac{3}{2} \log 5}$ $n < 11,18$ $\therefore n = 11$ <p><b>OR</b></p>	<p>✓ <math>(n^2)^{100} &lt; (5^3)^{100}</math></p> <p>✓ <math>n^2 &lt; 125</math></p> <p>✓ 11</p> <p>(3)</p> <p><b>OR</b></p> <p>✓ use of logs</p> <p>✓ <math>n &lt; 11,18</math></p> <p>✓ 11</p> <p>(3)</p> <p><b>OR</b></p>

	$n^{200} < 5^{300}$ $(n^2)^{100} < (5^3)^{100}$ $\sqrt{n^2} < \sqrt{5^3}$ $n < 5^{\frac{3}{2}}$ $n < 11,18$ $\therefore n = 11$ <p><b>OR</b></p> $n^{200} < 5^{300}$ $n < 5^{\frac{300}{200}}$ $n < 11,18$ $\therefore n = 11$	$\checkmark (n^2)^{100} < (5^3)^{100}$ $\checkmark n < 11,18$ $\checkmark 11 \quad (3)$ <p><b>OR</b></p> $\checkmark n < 5^{\frac{300}{200}}$ $\checkmark n < 11,18$ $\checkmark n = 11 \quad (3)$
		<b>[22]</b>

**QUESTION/VRAAG 2**

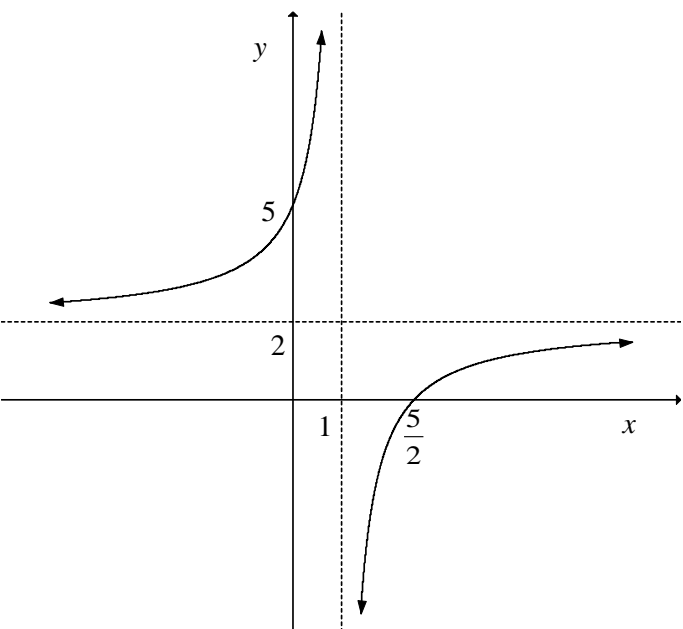
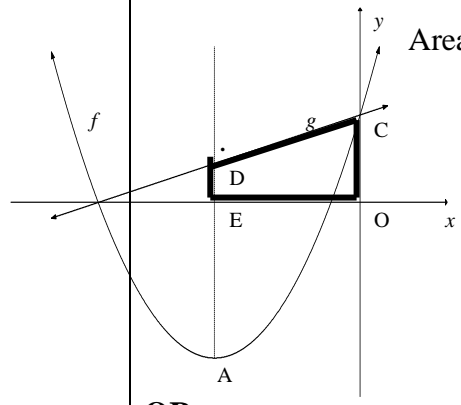
<p>2.1</p>	<p> <math>7 ; x ; y ; -11 ; \dots</math>  <math>a = 7</math>  <math>a + 3d = -11</math>  <math>7 + 3d = -11</math>  <math>d = -6</math>  <math>x = a + d = 7 + (-6) = 1</math>  <math>y = a + 2d = 7 + 2(-6) = -5</math> </p> <p><b>OR</b></p> <p> <math>a + 3d = -11</math>  <math>3d = -11 - 7</math>  <math>3d = -18</math>  <math>d = -6</math>  <math>x = 1</math>  <math>y = -5</math> </p> <p><b>OR</b></p> <p> <math>x - 7 = y - x</math>      and      <math>y - x = -11 - y</math>  <math>2x - 7 = y \dots(1)</math>      <math>2y = -11 + x \dots(2)</math> </p> <p>(1) into (2)</p> <p> <math>2(2x - 7) = -11 + x</math>  <math>4x - 14 = -11 + x</math>  <math>3x = 3</math>  <math>x = 1</math>  <math>y = 2(1) - 7 = -5</math> </p>	<p> <math>\checkmark 7 + 3d = -11</math>  <math>\checkmark d = -6</math>  <math>\checkmark</math> value of <math>x</math>  <math>\checkmark</math> value of <math>y</math> </p> <p>(4)</p> <p><b>OR</b></p> <p> <math>\checkmark 3d = -11 - 7</math>  <math>\checkmark d = -6</math>  <math>\checkmark x = 1</math>  <math>\checkmark y = -5</math> </p> <p>(4)</p> <p><b>OR</b></p> <p> <math>\checkmark</math> 2 equations  <math>\checkmark</math> substitution  <math>\checkmark</math> value of <math>x</math>  <math>\checkmark</math> value of <math>y</math> </p> <p>(4)</p>
<p>2.2.1</p>	<p> <math>-3 ; 6 ; 27 ; 60 ; \dots</math> </p> <p> <math>2a = 12</math>  <math>a = 6</math>  <math>3a + b = 9</math>  <math>3(6) + b = 9</math>  <math>b = -9</math>  <math>a + b + c = -3</math>  <math>6 - 9 + c = -3</math>  <math>c = 0</math>  <math>T_n = 6n^2 - 9n</math> </p>	<p> <math>\checkmark</math> second difference  <math>\checkmark a = 6</math>  <math>\checkmark b = -9</math>  <math>\checkmark c = 0</math> </p> <p>(4)</p>

2.2.2	$T_{50} = 6(50)^2 - 9(50)$ $= 14\ 550$	<b>Answer Only: Full Marks</b>	✓ substitute 50 ✓ answer (2)
2.2.3	$9 ; 21 ; 33 ; \dots$ $a = 9$ $d = 12$ $S_n = \frac{n}{2}[2a + (n-1)d]$ $S_n = \frac{n}{2}[2(9) + (n-1)(12)]$ $= \frac{n}{2}[18 + 12n - 12]$ $= \frac{n}{2}[12n + 6]$ $= 6n^2 + 3n$		✓ $a$ and $d$  ✓ substitution into the correct formula  ✓ $\frac{n}{2}[12n + 6]$  (3)
2.2.4	$-3 + S_n = 21060$ $S_n = 21063$ $6n^2 + 3n = 21063$ $6n^2 + 3n - 21063 = 0$ $2n^2 + n - 7021 = 0$ $n = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $n = \frac{-1 \pm \sqrt{(1)^2 - 4(1)(-7021)}}{2(2)}$ $n = 59 \text{ or } n \neq \frac{-119}{2}$ $\therefore n = 59$ <p><b>OR</b></p> $T_n = 21060$ $6n^2 - 9n - 21060 = 0$ $2n^2 - 3n - 7020 = 0$ $n = 60$ $\therefore 59 \text{ first differences must be added.}$		✓ $-3 + S_n = 21060$  ✓ equation ✓ standard form  ✓ answer  ✓ equation ✓ standard form  ✓✓ answer  (4)
			<b>[17]</b>

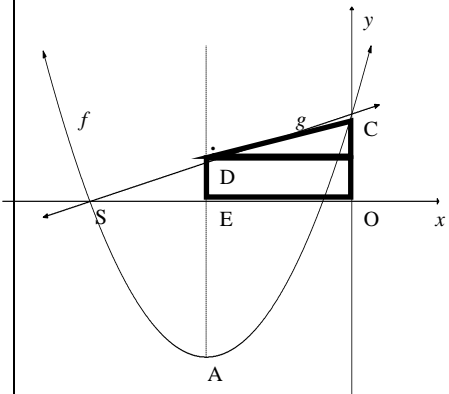
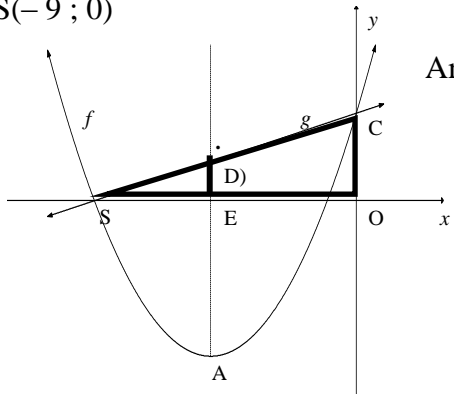
## QUESTION/VRAAG 3

3.1	$\sum_{k=1}^{\infty} 4 \cdot 3^{2-k} = 12 + 4 + \frac{4}{3} + \dots$ $r = \frac{4}{12} = \frac{1}{3}$ $-1 < \frac{1}{3} < 1$ $\therefore \text{series is convergent } (-1 < r < 1)$	$\checkmark 12 + 4 + \frac{4}{3} + \dots \text{ or } 36 \left(\frac{1}{3}\right)^k$ $\checkmark \text{ value of } r$ $\checkmark -1 < r < 1$ <p style="text-align: right;">(3)</p>
3.2	$\sum_{k=p}^{\infty} 4 \cdot 3^{2-k} = 4 \cdot 3^{2-p} + 4 \cdot 3^{1-p} + 4 \cdot 3^{-p} + \dots$ $a = 4 \cdot 3^{2-p}$ $r = \frac{1}{3}$ $S_{\infty} = \frac{a}{1-r}$ $\frac{2}{9} = \frac{4 \cdot 3^{2-p}}{1 - \frac{1}{3}}$ $4 \cdot 3^{2-p} = \frac{4}{27}$ $3^{2-p} = 3^{-3}$ $2 - p = -3$ $p = 5$	$\checkmark \text{ expression for } a$ $\checkmark \text{ substitution of } a, r \text{ and } S_{\infty}$ $\checkmark \text{ simplification } \left(4 \cdot 3^{2-p} = \frac{4}{27}\right)$ $\checkmark 3^{2-p} = 3^{-3}$ $\checkmark \text{ answer}$ <p style="text-align: right;">(5)</p>
		<b>[8]</b>

**QUESTION/VRAAG 4**

4.1.1	$x = 1$ $y = 2$	✓ $x = 1$ ✓ $y = 2$ (2)
4.1.2	$y = mx + c$ $y - y_1 = m(x - x_1)$ $y = -(x - p) + q$ $2 = -1 + c$ <b>or</b> $y - 2 = -1(x - 1)$ <b>or</b> $= -(x - 1) + 2$ $c = 3$ $y - 2 = -x + 1$ $y = -x + 3$ $y = -x + 3$ $y = -x + 3$	✓ substitution of $m = -1$ and $(1; 2)$ ✓ answer (2)
4.1.3		✓ vertical asymptote: $x = 1$ and horizontal asymptote: $y = 2$ ✓ $x$ -intercept: $\frac{5}{2}$ ✓ $y$ -intercept: 5 ✓ shape (A) (4)
4.2.1	$(-5; -8)$	✓ $x = -5$ ✓ $y = -8$ (2)
4.2.2	$y \geq -8$ <b>or</b> $[-8; \infty)$	✓ answer (1)
4.2.3	$m = -5$ $n = g(-5)$ $= \frac{1}{2}(-5) + \frac{9}{2}$ $= 2$	✓ $m = -5$ ✓ substitution ✓ $n = 2$ (3)
4.2.4	 <p>Area trapezium = <math>\frac{1}{2}(DE + OC) \times OE</math>  <math>= \frac{1}{2}(2 + 4,5) \times 5</math>  <math>= \frac{65}{4}</math> or 16,25</p> <p><b>OR</b></p>	✓ method ✓ correct substitution ✓ answer (3)  <b>OR</b>



	 <p>Area <math>\Delta = \frac{1}{2} b.h</math>  <math>= \frac{1}{2} (5) \left( \frac{5}{2} \right)</math>  <math>= \frac{25}{4}</math></p> <p>Area rect = <math>b.h</math>  <math>= (5)(2)</math>  <math>= 10</math></p> <p>Area trapezium = <math>\frac{25}{4} + 10 = \frac{65}{4}</math> or 16,25</p> <p><b>OR</b>  <math>S(-9; 0)</math></p>  <p>Area <math>\Delta SOC = \frac{1}{2} b.h</math>  <math>= \frac{1}{2} (9) \left( \frac{9}{2} \right)</math>  <math>= \frac{81}{4}</math></p> <p>Area <math>\Delta SED = \frac{1}{2} b.h = \frac{1}{2} (4)(2) = 4</math></p> <p>Area trapezium = area <math>\Delta SOC</math> - Area <math>\Delta SED</math>  <math>= \frac{81}{4} - 4</math>  <math>= \frac{65}{4}</math> or 16,25</p>	<p>✓ method</p> <p>✓ correct substitution                  ✓ answer (3)</p> <p><b>OR</b></p> <p>✓ method</p> <p>✓ correct substitution                  ✓ answer (3)</p>
<p>4.2.5</p>	<p><math>g^{-1}: x = \frac{1}{2} y + \frac{9}{2}</math></p> <p><math>g^{-1}: y = 2x - 9</math></p>	<p>✓ changing <math>x</math> and <math>y</math></p> <p>✓ answer (2)</p>

4.2.6	$f(x) = \frac{1}{2}(x+5)^2 - 8$ $f(x) = \frac{1}{2}(x^2 + 10x + 25) - 8$ $f(x) = \frac{1}{2}x^2 + 5x + 4,5$ $f'(x) = x + 5$ $h(x) = 2x - 9 + k$ $x + 5 = 2$ $x = -3 \quad y = -6$ $(-3; -6)$ <p><b>OR</b></p> $f(x) = h(x)$ $\frac{1}{2}(x+5)^2 - 8 = 2x - 9 + k$ $\frac{1}{2}x^2 + 3x + \frac{27}{2} - k = 0$ $x = \frac{-3}{2\left(\frac{1}{2}\right)} = -3 \quad b^2 - 4ac = 0$ $y = -6$ $(-3; -6)$	$\checkmark f'(x)$ $\checkmark x + 5 = 2$ $\checkmark x = -3 \quad \checkmark y = -6$ <p style="text-align: right;">(4)</p> <p><b>OR</b></p> $\checkmark \text{equating}$ $\checkmark \text{turning point} / \Delta = 0$ $\checkmark x = -3 \quad \checkmark y = -6$ <p style="text-align: right;">(4)</p>
		<b>[23]</b>

**QUESTION/VRAAG 5**

5.1	A(0 ; 1)	✓ answer (1)
5.2	$9 = 3^{-x}$ $3^2 = 3^{-x}$ $x = -2$ B(-2 ; 9)	✓ equating ✓ $3^2 = 3^{-x}$ ✓ $x = -2$ (3)
5.3	$x \in (0; \infty)$ or $x > 0$	✓✓ answer (2)
5.4	$h(x) = 27 \cdot 3^{-x}$ $h(x) = 3^{-(x-3)}$ <i>f</i> shifted 3 units to the right	✓ $h(x) = 3^{-(x-3)}$ ✓ 3 units ✓ right (3)
5.5	$\frac{27}{3^x} < 1$ $3^{-x+3} < 1$ $3^x > 27$ <b>or</b> $3^{-x+3} < 3^0$ $3^x > 3^3$ $-x+3 < 0$ $x > 3$ $x > 3$  <b>OR</b> The graph shifts 3 units to the right Thus the y-intercept shift 3 units to the right (3 ; 1) $\therefore x > 3$	✓ $3^x > 27$ <b>or</b> $3^{-x+3} < 3^0$ ✓ $3^x > 3^3$ <b>or</b> $-x+3 < 0$ ✓ $x > 3$ (3)  <b>OR</b> ✓ translation ✓ y-intercept ✓ answer (3)
		<b>[12]</b>

**QUESTION/VRAAG 6**

6.1.1	$F = \frac{x[(1+i)^n - 1]}{i}$ $= \frac{1\,000 \left[ \left( 1 + \frac{0,075}{12} \right)^{145} - 1 \right]}{\frac{0,075}{12}}$ $= R234\,888,53$	<p>✓ <math>n = 145</math>  ✓ <math>i = \frac{0,075}{12}</math>  ✓ substitution into the correct formula  ✓ answer</p> <p style="text-align: right;">(4)</p>
6.1.2	$A = P(1+i)^n$ $= 234\,888,53 \left( 1 + \frac{0,075}{12} \right)^{12}$ $= R253\,123,54$	<p>✓ substitution into the correct formula  ✓ answer</p> <p style="text-align: right;">(2)</p>
6.2	$A = P(1-i)^n$ $92\,537,64 = 250\,000(1-0,22)^n$ $0,37015056 = (0,78)^n$ $n = \frac{\log 0,37015056}{\log 0,78}$ $n = 4 \text{ years}$	<p>✓ substitution into the correct formula  ✓ correct use of logs  ✓ answer</p> <p style="text-align: right;">(3)</p>
6.3.1	<p>Loan amount: <math>= \frac{x[1 - (1+i)^{-n}]}{i}</math></p> $= \frac{1\,500 \left[ 1 - \left( 1 + \frac{0,113}{12} \right)^{-72} \right]}{\frac{0,113}{12}}$ $= R78\,173,49323$	<p>✓ 72  ✓ substitution into the correct formula  ✓ answer</p> <p style="text-align: right;">(3)</p>
6.3.2	<p>Balance after 5 years: <math>P = \frac{x[1 - (1+i)^{-n}]}{i}</math></p> $= \frac{1\,500 \left[ 1 - \left( 1 + \frac{0,113}{12} \right)^{-12} \right]}{\frac{0,113}{12}}$ $= R16\,945,00629$ <p>Amount paid: <math>R1\,500 \times 60 = R90\,000</math></p> <p>Interest  = Amount paid – [Loan – Balance]  = <math>R90\,000 - [R78\,173,49323 - R16\,945,00629]</math>  = <math>R28\,771,51</math></p>	<p>✓ substitution (A)  ✓ <math>R16\,945,00629</math> (A)  ✓ <math>R90\,000 - [Loan - Balance]</math>  ✓ answer</p> <p style="text-align: right;">(4)</p>

	<p><b>OR</b> Balance</p> $= 78\,173,49 \left(1 + \frac{0,133}{12}\right)^{60} - \frac{1\,500 \left( \left(1 + \frac{0,113}{12}\right)^{60} - 1 \right)}{\frac{0,113}{12}}$ <p>Balance = R16 945.00</p> <p>Amount paid: R1 500 × 60 = R90 000</p> <p>Interest = Amount paid – [Loan – Balance] = R90 000 – [ R78 173,49323 – R16 945,00629] = R28 771,51</p>	<p><b>OR</b></p> <p>✓ substitution</p> <p>✓ R16 945,00629</p> <p>✓ R90 000 – [Loan – Balance]</p> <p>✓ answer (4)</p>
		<b>[16]</b>

**QUESTION/VRAAG 7**

**Penalty of – 1 for notation only in 7.1**

<p>7.1</p>	$f(x) = 2x^2 - 1$ $f(x+h) = 2(x+h)^2 - 1$ $= 2(x^2 + 2xh + h^2) - 1$ $= 2x^2 + 4xh + 2h^2 - 1$ $f(x+h) - f(x) = 2x^2 + 4xh + 2h^2 - 1 - (2x^2 - 1)$ $= 2x^2 + 4xh + 2h^2 - 1 - 2x^2 + 1$ $= 4xh + 2h^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{4xh + 2h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(4x + 2h)}{h}$ $= \lim_{h \rightarrow 0} (4x + 2h)$ $= 4x$	<p>✓ <math>2x^2 + 4xh + 2h^2 - 1</math></p> <p>✓ <math>4xh + 2h^2</math></p> <p>✓ substitution</p> <p>✓ simplification</p> <p>✓ answer</p> <p style="text-align: right;">(5)</p>
<p>7.2.1</p>	$\frac{d}{dx} \left( \sqrt[5]{x^2} + x^3 \right)$ $= \frac{d}{dx} \left( x^{\frac{2}{5}} + x^3 \right)$ $\frac{dy}{dx} = \frac{2}{5} x^{-\frac{3}{5}} + 3x^2$	<p>✓ <math>x^{\frac{2}{5}}</math></p> <p>✓ <math>\frac{2}{5} x^{-\frac{3}{5}}</math> ✓ <math>3x^2</math></p> <p style="text-align: right;">(3)</p>
<p>7.2.2</p>	$f(x) = \frac{4x^2 - 9}{4x + 6}$ $= \frac{(2x-3)(2x+3)}{2(2x+3)}$ $= \frac{2x-3}{2}$ $= x - \frac{3}{2}$ $f'(x) = 1$	<p>✓ <math>(2x-3)(2x+3)</math></p> <p>✓ <math>2(2x+3)</math></p> <p>✓ simplification to two separate terms</p> <p>✓ answer</p> <p style="text-align: right;">(4)</p>
<p><b>[12]</b></p>		

**QUESTION/VRAAG 8**

8.1	$-1 < x < 2$	✓✓ answer (2)
8.2	$x = \frac{-1+2}{2}$ $x = \frac{1}{2}$ <div style="border: 1px solid black; padding: 5px; display: inline-block; margin: 10px 0;"> <b>Answer Only: Full Marks</b> </div>	✓ method ✓ answer (2)
8.3	From the graph $x > \frac{1}{2}$ <div style="border: 1px solid black; padding: 5px; display: inline-block; margin: 10px 0;"> <b>Answer Only: Full Marks</b> </div>	✓✓ answer (2)
8.4	$g(x) = ax^3 + bx^2 + cx$ $g'(x) = 3ax^2 + 2bx + c = -6x^2 + 6x + 12$ $3a = -6. \quad 2b = 6 \quad c = 12$ $a = -2 \quad b = 3$ $g(x) = -2x^3 + 3x^2 + 12x$	✓ $g'(x) = 3ax^2 + 2bx + c$ ✓ $a = -2$ ✓ $b = 3$ ✓ $g(x) = -2x^3 + 3x^2 + 12x$ (4)
8.5	$g'\left(\frac{1}{2}\right) = -6\left(\frac{1}{2}\right)^2 + 6\left(\frac{1}{2}\right) + 12$ $m = \frac{27}{2} \quad \text{or } 13,5$ $y = -2\left(\frac{1}{2}\right)^3 + 3\left(\frac{1}{2}\right)^2 + 12\left(\frac{1}{2}\right)$ $y = \frac{13}{2} \quad \text{or } 6,5$ $y - y_1 = m(x - x_1)$ $y - 6,5 = 13,5(x - 0,5)$ $y = 13,5x - 0,25$	✓ max gradient at $x = \frac{1}{2}$ ✓ answer  ✓ y value ✓ substitution ✓ answer (5)
		<b>[15]</b>

**QUESTION/VRAAG 9**

9.1	<p>Total surface area = <math>2\ell w + 2wh + 2\ell h</math>  but: <math>\ell = 3w</math>  Total surface area = <math>6w^2 + 2wh + 6wh</math></p> $C = 15(6w^2) + 6(2wh + 6wh)$ $= 15(6w^2) + 6(8wh)$ $= 90w^2 + 48wh$	<p>✓ <math>2\ell w + 2wh + 2\ell h</math>  ✓ <math>\ell = 3w</math></p> <p>✓ <math>15(6w^2)</math>  ✓ <math>6(2wh + 6wh)</math></p> <p style="text-align: right;">(4)</p>
9.2	$5 = 3w^2h$ $h = \frac{5}{3w^2}$ $C = 90w^2 + 48wh$ $C(w) = 90w^2 + 48w\left(\frac{5}{3w^2}\right)$ $= 90w^2 + 80w^{-1}$ $C'(w) = 180w - 80w^{-2}$ $180w - 80w^{-2} = 0$ $180w^3 - 80 = 0$ $w^3 = \frac{80}{180}$ $w = \sqrt[3]{\frac{80}{180}}$ $w = 0,76$	<p>✓ <math>h = \frac{5}{3w^2}</math></p> <p>✓ substitution</p> <p>✓ <math>C(w) = 90w^2 + 80w^{-1}</math>  ✓ derivative  ✓ equating derivative to zero</p> <p>✓ value of <math>w</math></p> <p style="text-align: right;">(6)</p>
		<b>[10]</b>



**QUESTION/VRAAG 10**

10.1	$10^{10}$ or 10 000 000 000	✓✓ answer (2)
10.2.1	$\frac{8 \times 10 \times 10}{\text{Area}} \times \frac{8 \times 8 \times 10}{\text{exchange}} \times \frac{2 \times 10 \times 10 \times 10}{\text{number}}$ <p>No. of valid 10-digit numbers  <math>= (8 \times 10 \times 10) \times (8 \times 8 \times 10) \times (2 \times 10 \times 10 \times 10)</math>  <math>= 1,024 \times 10^9</math></p>	✓ $8 \times 10 \times 10$ or $8 \times 8 \times 10$ ✓ $2 \times 10 \times 10 \times 10$ ✓ $1,024 \times 10^9$ (A) (3)
10.2.2	Probability $= \frac{1,024 \times 10^9}{10^{10}}$ $= \frac{64}{625} = 0,1024 = 10,24\%$	✓ $\frac{1,024 \times 10^9}{10^{10}}$ ✓ answer (2)
		<b>[7]</b>

**QUESTION/VRAAG 11**

11	<p>First shot    Second shot    Third shot</p>	
11.1	P (Bull's eye first shot and second shot) $= 0,5 \times 0,5$ $= 0,25$ or $\frac{1}{4}$	✓ two 0,5's ✓ $0,5 \times 0,5$ (2)

11.2	<p>P (Bull's eye at least twice in 3 shots)</p> $= (0,5 \times 0,5 \times 0,5) + (0,5 \times 0,5 \times 0,5) + (0,5 \times 0,5 \times 0,5) + (0,5 \times 0,5 \times 0,5)$ $= 0,125 + 0,125 + 0,125 + 0,125$ $= 0,5 \quad \text{or} \quad \frac{1}{2}$	<p>✓ <math>0,5 \times 0,5 \times 0,5</math></p> <p>✓ four events</p> <p>✓ answer (A)</p> <p style="text-align: right;">(3)</p>
11.3	<p>Person shoots first:</p> $(0,5) + (0,5)^3 + (0,5)^5 + \dots$ $P = \frac{a}{1-r}$ $P = \frac{0,5}{1-0,25}$ $P = \frac{2}{3} = 0,67$	<p>✓ <math>(0,5) + (0,5)^3</math></p> <p>✓ <math>\dots + (0,5)^5 + \dots</math></p> <p>✓ <math>P = \frac{0,5}{1-0,25}</math></p> <p style="text-align: right;">(3)</p>
		<b>[8]</b>

**TOTAL/TOTAAL: 150**