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**NATIONAL
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SERTIFIKAAT**

GRADE/GRAAD 12

SEPTEMBER 2022

**MATHEMATICS P1/ WISKUNDE V1
MARKING GUIDELINE/NASIENRIGLYN**

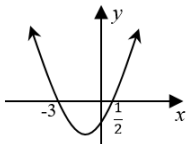
MARKS/PUNTE: 150

This marking guideline consists of 16 pages.
Hierdie nasienriglyn bestaan uit 16 bladsye.

NOTE/LET WEL:

- If a candidate answers a question TWICE, mark the FIRST attempt ONLY.
Indien 'n kandidaat 'n vraag TWEE keer beantwoord, merk SLEGS die EERSTE poging.
- Consistent accuracy applies in ALL aspects of the marking guideline.
Volgehoue akkuraatheid geld deurgaans in ALLE aspekte van die nasienriglyn.
- If a candidate crossed out an attempt of a question and did not redo the question, mark the crossed-out attempt.
Indien 'n kandidaat 'n poging vir 'n vraag deurgetrek het en nie die vraag weer beantwoord het nie, merk die poging wat deurgetrek is.
- The mark for substitution is awarded for substitution into the correct formula.
- *Die punt vir substitusie word toegeken vir substitusie in die korrekte formule.*

QUESTION 1/VRAAG 1

1.1.1	$x^2 + 4x - 21 = 0$ $(x - 3)(x + 7) = 0$ $\therefore x = 3 \quad \text{or / of} \quad x = -7$ <p style="text-align: center;">OR/OF</p> $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-4 \pm \sqrt{4^2 - 4(1)(-21)}}{2(1)}$ $= \frac{-4 \pm \sqrt{100}}{2}$ $= 3 \quad \text{or / of} \quad -7$	<p>✓ factors / faktore</p> <p>✓ both x-values / beide x-waardes</p> <p style="text-align: right;">(2)</p> <p style="text-align: center;">OR/OF</p> <p>✓ substitution / vervanging</p> <p>✓ both x-values / beide x-waardes</p> <p style="text-align: right;">(2)</p>
1.1.2	$x(2x - 7) = 3$ $2x^2 - 7x - 3 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-7) \pm \sqrt{(-7)^2 - 4(2)(-3)}}{2(2)}$ $= \frac{7 \pm \sqrt{73}}{4}$ $= 3,89 \quad \text{or / of} \quad -0,39$	<p>✓ standard form / standaardvorm</p> <p>✓ substitution / vervanging</p> <p>✓ $x = 3,89$ or/of ✓ $x = -0,39$</p> <p style="text-align: right;">(4)</p>
1.1.3	$(2x + 3)(x + 1) < 6$ $2x^2 + 5x + 3 < 6$ $2x^2 + 5x - 3 < 0$ $(2x - 1)(x + 3) < 0$ $\therefore -3 < x < \frac{1}{2}$	<div style="text-align: center;">  </div> <p>✓ standard form / standaardvorm</p> <p>✓ factors / faktore</p> <p>✓✓ $-3 < x < \frac{1}{2}$</p> <p>(Accuracy/Akkuraatheid)</p> <p style="text-align: right;">(4)</p>

<p>1.1.4</p> $2\sqrt{x} + x = 3$ $2\sqrt{x} = 3 - x$ $(2\sqrt{x})^2 = (3 - x)^2$ $4x = 9 - 6x + x^2$ $\therefore x^2 - 10x + 9 = 0$ $(x - 1)(x - 9) = 0$ $\therefore x = 1 \text{ or / of } x \neq 9$ <p style="text-align: center;">OR/OF</p> $2\sqrt{x} + x = 3$ $x + 2\sqrt{x} - 3 = 0$ <p>Let $k = \sqrt{x}$,</p> $\therefore k^2 + 2k - 3 = 0$ $(k - 1)(k + 3) = 0$ $k = 1 \text{ or / of } k = -3$ $\therefore \sqrt{x} = 1 \text{ or / of } \sqrt{x} \neq -3 \dots (\sqrt{x} \geq 0)$ $\therefore x = 1$	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>In this question, CA marking applies only if the k equation is quadratic. <i>In hierdie vraag, kan VA nasien slegs toegepas word as die vergelyking van k kwadraties is.</i></p> </div>	<ul style="list-style-type: none"> ✓ squaring both sides <i>kwadreer beide kante</i> ✓ standard form / <i>standaardvorm</i> ✓ factors / <i>faktore</i> ✓ both answers / <i>beide antwoorde</i> ✓ selection / <i>keuse</i> (5) <p style="text-align: center;">OR/OF</p> <ul style="list-style-type: none"> ✓ standard form / <i>standaardvorm</i> ✓ $k^2 + 2k - 3 = 0$ (Accuracy/Akkuraatheid) ✓ factors / <i>faktore</i> ✓ both k-values / <i>albei k-waardes</i> ✓ selection of x-value / <i>keuse van x-waarde</i> <p style="text-align: right;">(5)</p>
<p>1.2</p> $2y + x + 3 = 0 \dots\dots\dots(1)$ $x^2 + y^2 + 2xy = 1 \dots\dots\dots(2)$ $x = -2y - 3 \dots\dots\dots(3)$ <p>Substitute (3) into (2) / <i>Vervang (3) in (2)</i></p> $(-2y - 3)^2 + y^2 + 2y(-2y - 3) = 1$ $4y^2 + 12y + 9 + y^2 - 4y^2 - 6y - 1 = 0$ $y^2 + 6y + 8 = 0$ $(y + 2)(y + 4) = 0$ $\therefore y = -4 \text{ or / of } y = -2$ $\therefore x = 5 \text{ or / of } x = 1$ <p style="text-align: center;">OR/OF</p>		<ul style="list-style-type: none"> ✓ $x = -2y - 3$ ✓ substitution / <i>vervanging</i> ✓ standard form / <i>standaardvorm</i> ✓ factors / <i>faktore</i> ✓ y-values / <i>y-waardes</i> ✓ x-values / <i>x-waardes</i> <p style="text-align: right;">(6)</p> <p style="text-align: center;">OR/OF</p>

	$2y + x + 3 = 0 \dots\dots\dots(1)$ $x^2 + y^2 + 2xy = 1 \dots\dots\dots(2)$ $y = -\frac{x+3}{2} \dots\dots\dots(3)$ <p>Substitute (3) into (2), <i>Vervang (3) in (2)</i> :</p> $x^2 + \left(-\frac{x+3}{2}\right)^2 + 2x\left(-\frac{x+3}{2}\right) = 1$ $x^2 + \frac{(x+3)^2}{4} - x(x+3) - 1 = 0$ $4x^2 + x^2 + 6x + 9 - 4x^2 - 12x - 4 = 0$ $x^2 - 6x + 5 = 0$ $(x-5)(x-1) = 0$ <p>$\therefore x = 1$ or / of $x = 5$</p> <p>$\therefore y = -2$ or / of $y = -4$</p>	$\checkmark y = -\frac{x+3}{2}$ <p>\checkmark substitution / <i>vervanging</i></p> <p>\checkmark standard form / <i>standaardvorm</i></p> <p>\checkmark factors / <i>faktore</i></p> <p>\checkmark x-values / <i>x-waardes</i></p> <p>\checkmark y-values / <i>y-waardes</i></p> <p style="text-align: right;">(6)</p>
<p>1.3</p>	$K^{\frac{1}{x}} \times K^{\frac{1}{y}} = 12 \dots\dots(4)$ <p>$\therefore K^{\frac{1}{x}} \times K^{\frac{1}{y}} = K^{\frac{1}{w}} \dots\dots\dots(\text{both / beide} = 12)$</p> $K^{\frac{1}{x} + \frac{1}{y}} = K^{\frac{1}{w}}$ $\Rightarrow \frac{1}{x} + \frac{1}{y} = \frac{1}{w}$ $\frac{x+y}{xy} = \frac{1}{w}$ <p>$\therefore w = \frac{xy}{x+y}$ (reciprocals / <i>omgekeerdes</i>)</p>	<p>\checkmark multiplying / <i>vermenigvuldiging</i></p> <p>\checkmark equating / <i>gelykstel</i></p> <p>\checkmark exp. Law / <i>eks. Wet</i></p> <p>\checkmark simplification / <i>vereenvoudiging</i></p> <p style="text-align: right;">(4)</p>
		<p>[25]</p>

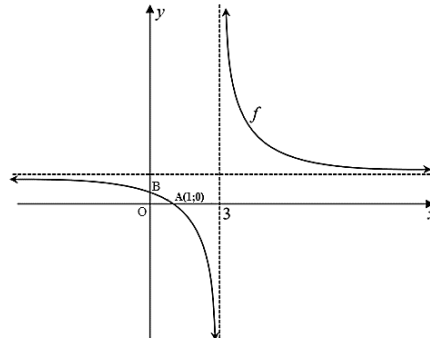
QUESTION 2/VRAAG 2

<p>2.1.1</p>	$3d = (2x + 8) - (3x - 1)$ $3d = -x + 9$ $3(4) = -x + 9$ $\therefore x = -3$	<p>✓ $3d = (2x + 8) - (3x - 1)$</p> <p>✓ substitution / <i>vervanging</i></p> <p>✓ answer / <i>antwoord</i> (3)</p>			
<p>2.1.2 (a)</p>	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> $T_4 = 3x - 1$ $= 3(-3) - 1$ $= -10$ $\therefore a + 3d = -10$ $a + 3(4) = -10$ $a = -22$ </td> <td style="width: 10%; text-align: center; border: none;"> <p>or / of</p> </td> <td style="width: 50%; border: none;"> $T_7 = 2x + 8$ $= 2(-3) + 8$ $= 2$ $a + 6d = 2$ $a + 6(4) = 2$ $a = -22$ </td> </tr> </table>	$T_4 = 3x - 1$ $= 3(-3) - 1$ $= -10$ $\therefore a + 3d = -10$ $a + 3(4) = -10$ $a = -22$	<p>or / of</p>	$T_7 = 2x + 8$ $= 2(-3) + 8$ $= 2$ $a + 6d = 2$ $a + 6(4) = 2$ $a = -22$	<p>✓ substitution / <i>vervanging</i></p> <p>✓ $T_4 = -10$ or / of $T_7 = 2$</p> <p>✓ answer / <i>antwoord</i> (3)</p>
$T_4 = 3x - 1$ $= 3(-3) - 1$ $= -10$ $\therefore a + 3d = -10$ $a + 3(4) = -10$ $a = -22$	<p>or / of</p>	$T_7 = 2x + 8$ $= 2(-3) + 8$ $= 2$ $a + 6d = 2$ $a + 6(4) = 2$ $a = -22$			
<p>2.1.2 (b)</p>	$S_n = \frac{n}{2}[2a + (n - 1)d]$ $S_{42} = \frac{42}{2}[2(-22) + (42 - 1)(4)]$ $= 2520$	<p>✓ formula / <i>formule</i></p> <p>✓ substitution / <i>vervanging</i></p> <p>✓ answer / <i>antwoord</i> (3)</p>			
<p>2.2.1</p>	<p>$T_2 = 39$ and / en $T_3 = 21$</p>	<p>✓✓ answers / <i>antwoorde</i> (2)</p>			
<p>2.2.2</p>	<table style="width: 100%; border: none;"> <tr> <td style="width: 50%; border: none;"> $T_n = 2n^2 - 28n + 87$ $T'_n = 4n - 28$ <p>At/by min : $4n - 28 = 0$</p> $4n = 28$ $\therefore n = 7$ $T_7 = 2(7)^2 - 28(7) + 87$ $= -11$ <p style="text-align: center;">OR/OF</p> $T_n = 2n^2 - 28n + 87$ $= 2(n^2 - 14n + 49 - 49) + 87$ $= 2[(n - 7)^2 - 49] + 87$ $= 2(n - 7)^2 - 98 + 87$ $= 2(n - 7)^2 - 11$ <p>\therefore Smallest value/<i>kleinste waarde</i> = -11</p> </td> <td style="width: 10%; text-align: center; border: none;"> <p>OR/OF</p> </td> <td style="width: 50%; border: none;"> $n = \frac{-b}{2a}$ $= \frac{-(-28)}{2(2)}$ $= 7$ </td> </tr> </table>	$T_n = 2n^2 - 28n + 87$ $T'_n = 4n - 28$ <p>At/by min : $4n - 28 = 0$</p> $4n = 28$ $\therefore n = 7$ $T_7 = 2(7)^2 - 28(7) + 87$ $= -11$ <p style="text-align: center;">OR/OF</p> $T_n = 2n^2 - 28n + 87$ $= 2(n^2 - 14n + 49 - 49) + 87$ $= 2[(n - 7)^2 - 49] + 87$ $= 2(n - 7)^2 - 98 + 87$ $= 2(n - 7)^2 - 11$ <p>\therefore Smallest value/<i>kleinste waarde</i> = -11</p>	<p>OR/OF</p>	$n = \frac{-b}{2a}$ $= \frac{-(-28)}{2(2)}$ $= 7$	<p>✓ method/<i>metode</i></p> <p>✓ $n = 7$</p> <p>✓ answer / <i>antwoord</i> (3)</p> <p style="text-align: center;">OR/OF</p> <p>✓ completing the square <i>voltooiing van vierkant</i></p> <p>✓ simplification / <i>vereenvoudiging</i></p> <p>✓ correct conclusion <i>korrekte gevolgtrekking</i> (3)</p>
$T_n = 2n^2 - 28n + 87$ $T'_n = 4n - 28$ <p>At/by min : $4n - 28 = 0$</p> $4n = 28$ $\therefore n = 7$ $T_7 = 2(7)^2 - 28(7) + 87$ $= -11$ <p style="text-align: center;">OR/OF</p> $T_n = 2n^2 - 28n + 87$ $= 2(n^2 - 14n + 49 - 49) + 87$ $= 2[(n - 7)^2 - 49] + 87$ $= 2(n - 7)^2 - 98 + 87$ $= 2(n - 7)^2 - 11$ <p>\therefore Smallest value/<i>kleinste waarde</i> = -11</p>	<p>OR/OF</p>	$n = \frac{-b}{2a}$ $= \frac{-(-28)}{2(2)}$ $= 7$			
<p>2.2.3</p>	<p>$k > 11$</p>	<p>✓✓ answer / <i>antwoord</i> (2)</p>			
<p>[16]</p>					

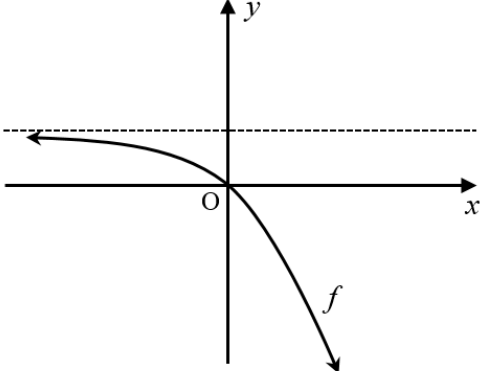
QUESTION 3/VRAAG 3

3.1.1	$0,7 = 0,777777\dots$ $= 0,7 + 0,07 + 0,007 + \dots$	$\checkmark 0,7 + 0,07 + 0,007 + \dots$ <p style="text-align: right;">(1)</p>
3.1.2	$a = 0,7 \quad r = 0,1$ $T_n = ar^{n-1}$ $= (0,7)(0,1)^{n-1}$ $\therefore p = \sum_{n=1}^{\infty} (0,7)(0,1)^{n-1}$	$\checkmark a = 0,7 \quad \text{and / en } r = 0,1$ $\checkmark T_n = (0,7)(0,1)^{n-1}$ $\checkmark \text{ answer / antwoord}$ <p style="text-align: right;">(3)</p>
3.1.3	$S_{\infty} = \frac{a}{1-r}$ $= \frac{0,7}{1-0,1}$ $= \frac{7}{9}$	$\checkmark \frac{0,7}{1-0,1}$ $\checkmark \text{ answer / antwoord}$ <p style="text-align: right;">(2)</p>
3.2	$T_9 + T_{10} = 6 \times T_8$ $ar^8 + ar^9 = 6 \times ar^7$ $\frac{ar^7(r+r^2)}{ar^7} = 6$ $r^2 + r - 6 = 0$ $(r+3)(r-2) = 0$ $\therefore r = -3 \quad \text{or / of } r = 2$	$\checkmark ar^8 + ar^9 = 6 \times ar^7$ $\checkmark \text{ simplification / vereenvoudiging}$ $\checkmark \text{ standard form / standaardvorm}$ $\checkmark \text{ answers / antwoorde}$ <p style="text-align: right;">(4)</p>
		[10]

QUESTION 4/VRAAG 4

		
4.1	$p = -3$	✓ answer / antwoord (1)
4.2	$0 = \frac{1+k}{1+p}$ $\therefore 0 = 1+k$ $k = -1$	✓ substitution / vervanging ✓ $k = -1$ (2)
4.3	$f(x) = \frac{2}{x-3} + 1$ $y = \frac{2}{0-3} + 1$ $= 1 - \frac{2}{3}$ $= \frac{1}{3}$ $\therefore \text{y intercept is at } B\left(0; \frac{1}{3}\right) / \text{y-afsnit is by } B\left(0; \frac{1}{3}\right)$	✓ substitution / vervanging ✓ y-value / y-waarde (2)
4.4	$x \leq 0$ or / of $1 \leq x < 3$ <p style="text-align: center;">OR/OF</p> $x \in (-\infty; 0]$ or / of $x \in [1; 3)$	✓ $x \leq 0$ ✓✓ $1 \leq x < 3$ Accuracy / Akkuraatheid (3) <p style="text-align: center;">OR/OF</p> ✓ $x \in (-\infty; 1]$ Accuracy/Akkuraatheid ✓✓ $x \in [1; 3)$ Accuracy/Akkuraatheid (3)
4.5	$f(x) = \frac{x-1}{x-3}$ $= \frac{(x-3)+2}{x-3}$ $= \frac{2}{x-3} + \frac{x-3}{x-3}$ $= \frac{2}{x-3} + 1$	✓ $\frac{(x-3)+2}{x-3}$ ✓ answer / antwoord (2)
		[10]

QUESTION 5/VRAAG 5

5.1		✓ asymptote / <i>asimptoot</i> ✓ intercept / <i>afsnit</i> ✓ shape / <i>vorm</i> (3)
5.2	$y < 1, y \in \mathbb{R}$ <p style="text-align: center;">OR/OF</p> $y \in (-\infty; 1)$	✓✓ $y < 1$ Accuracy / <i>Akkuraatheid</i> (2) <p style="text-align: center;">OR/OF</p> ✓✓ $y \in (-\infty; 1)$ Accuracy/ <i>Akkuraatheid</i> (2)
5.3	$g(x) = -(-3^x + 1)$ $= 3^x - 1$ \therefore Asymptote / <i>Asimptoot</i> : $y = -1$	<div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 0 auto;"> <p style="text-align: center;">Answer only – Full Marks <i>Slegs antwoord – Volpunte</i></p> </div> ✓ $3^x - 1$ ✓ answer / <i>antwoord</i> (2)
5.4	$h(x) = 3^x$ $x = 3^y$ $\therefore y = \log_3 x$	✓ $h(x) = 3^x$ ✓ $x = 3^y$ ✓ answer / <i>antwoord</i> (3)
		[10]

QUESTION 6/VRAAG 6

<p>6.1.1</p>	$x = -\frac{b}{2a} \qquad 2x - 4 = 0$ $= -\frac{(-4)}{2(1)} \quad \text{OR / OF} \quad 2x = 4$ $= 2 \qquad x = 2$ $y = (2)^2 - 4(2) - 11$ $= -15$ <p>$D(2; -15)$</p>	<p>✓ subst. into correct formula <i>verv. in korrekte formule</i> (method mark / metodepunt)</p> <p>✓ <i>x-value / x-waarde</i></p> <p>✓ <i>y-value / y-waarde</i></p> <p>(3)</p>
<p>6.1.2</p>	$g(x) = f'(x) = 2x - 4$ <p><i>coordinates of C / koördinate van C :</i> $C(2; 0)$</p> <p style="text-align: center;">OR/OF</p> <p>Making connection between <i>x</i>-coordinate of T/P of the function and the <i>x</i>-intercept of the derivative of the function. Concluding that $C(2; 0)$.</p> <p><i>Maak konneksie tussen x-koordinaat van draaipunt van die funksie en die x-afsnit van die afgeleide van die funksie. Gevolglik is C(2; 0).</i></p> $CN = \sqrt{(7-2)^2 + (10-0)^2}$ $= \sqrt{125}$ $= 5\sqrt{5}$	<p>✓✓ <i>coordinates of C</i> <i>koördinate van C</i></p> <p>✓ substitution / <i>vervanging</i></p> <p>✓ <i>answer / antwoord</i> (4)</p>
<p>6.2.1</p>	$-1 < x < 7$	<p>✓✓ <i>answer / antwoord</i> (2)</p>
<p>6.2.2</p>	$g(x) - f(x)$ $= 2x - 4 - (x^2 - 4x - 11)$ $= -x^2 + 6x + 7$ <p>For maximum / Vir maksimum: $-2x + 6 = 0$</p> <p style="text-align: right;">$\therefore x = 3$</p>	<p>✓ difference / <i>verskil</i></p> <p>✓ derivative / <i>afgeleide</i> ✓ equating derivative to 0 <i>stel afgeleide = 0</i></p> <p>✓ <i>answer / antwoord</i> (4)</p>
<p>[13]</p>		

QUESTION 7/VRAAG 7

7.1	$A = P(1 - i)^n$ $R\ 27\ 763,12 = P(1 - 0,17)^4$ $P = \frac{27\ 763,12}{0,83^4}$ $= R\ 58\ 500$	<p>✓ substitution / <i>vervanging</i></p> <p>✓ answer / <i>antwoord</i></p> <p>(2)</p>
7.2	$F = \frac{x[(1 + i)^n - 1]}{i}$ $R\ 300\ 000 = \frac{x \left[\left(1 + \frac{0,086}{12} \right)^{84} - 1 \right]}{\frac{0,086}{12}}$ $x = \frac{R\ 300\ 000 \times \frac{0,086}{12}}{\left[\left(1 + \frac{0,086}{12} \right)^{84} - 1 \right]}$ $\therefore x = R\ 2\ 616,05$	<p>✓ $i = \frac{0,086}{12}$ and / en $n = 84$</p> <p>✓ correct substitution into correct formula / <i>korrekte vervanging in die korrekte formule</i></p> <p>✓ answer / <i>antwoord</i></p> <p>(3)</p>
7.3.1	$P = \frac{x \left[1 - (1 + i)^{-n} \right]}{i}$ $R\ 8\ 901,96 = \frac{x \left[1 - \left(1 + \frac{0,104}{12} \right)^{-300} \right]}{\frac{0,104}{12}}$ $= R\ 950\ 000$	<p>✓ $\frac{0,104}{12}$ and / en $n = -300$</p> <p>✓ correct substitution into correct formula / <i>korrekte vervanging in die korrekte formule</i></p> <p>✓ answer / <i>antwoord</i></p> <p>(3)</p>

<p>7.3.2(a)</p>	<p>Outstanding balance after 204 payments: <i>Uitstaande balans na 204 betalings</i></p> $P = \frac{x \left[1 - (1 + i)^{-n} \right]}{i}$ $= \frac{R 8 901,96 \left[1 - \left(1 + \frac{0,104}{12} \right)^{-96} \right]}{\frac{0,104}{12}}$ $= R 578 551,24$ <p style="text-align: center;">OR / OF</p> <p>$O / B = A - F_v$</p> $P(1 + i)^n - \frac{x \left[(1 + i)^n - 1 \right]}{i}$ $950\ 000 \left(1 + \frac{0,104}{12} \right)^{204} - \frac{8\ 901,96 \left[\left(1 + \frac{0,104}{12} \right)^{204} - 1 \right]}{\frac{0,104}{12}}$ $5\ 523\ 928,831830547 - 4\ 945\ 376,296008371$ $R\ 578\ 552,54$	<p>✓ $n = 96$</p> <p>✓ correct substitution into correct formula / <i>korrekte vervanging in die korrekte formule</i></p> <p>✓ answer / <i>antwoord</i></p> <p style="text-align: right;">(3)</p> <p style="text-align: center;">OR / OF</p> <p>✓ $n = 204$</p> <p>✓ correct substitution into correct formula / <i>korrekte vervanging in die korrekte formule</i></p> <p>✓ answer / <i>antwoord</i></p> <p style="text-align: right;">(3)</p>
<p>7.3.2(b)</p>	$R 578 551,24 = \frac{R 7 500 \left[1 - \left(1 + \frac{0,104}{12} \right)^{-n} \right]}{\frac{0,104}{12}}$ $1 - \frac{R 578 551,24 \times \frac{0,104}{12}}{R 7 500} = \left(\frac{1513}{1500} \right)^{-n}$ $\therefore \log_{\left(\frac{1513}{1500} \right)} 0,13315 = -n$ $-n = -127,97$ $\therefore n = 128 \text{ months/maande}$ $= 10 \text{ years } 8 \text{ months}$ $10 \text{ jaar } 8 \text{ maande}$	<p>✓ $P = R 578 551,24$ in P – formula / <i>in P – formule</i></p> <p>✓ simplification / <i>vereenvoudiging</i> (isolating n / <i>isoleer n</i>)</p> <p>✓ correct use of logs / <i>korrekte gebruik van logs</i></p> <p>✓ answer / <i>antwoord (months)</i></p> <p style="text-align: right;">(4)</p>
<p>[15]</p>		

QUESTION 8/VRAAG 8

8.1	$f(x) = -3x^2 + x$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{-3(x+h)^2 + (x+h) - (-3x^2 + x)}{h}$ $= \lim_{h \rightarrow 0} \frac{-3x^2 - 6xh - 3h^2 + x + h + 3x^2 - x}{h}$ $= \lim_{h \rightarrow 0} \frac{-6xh - 3h^2 + h}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-6x - 3h + 1)}{h}$ $= \lim_{h \rightarrow 0} (-6x - 3h + 1)$ $= -6x + 1$ <p style="text-align: center;">OR/OF</p> $f(x) = -3x^2 + x$ $f(x+h) - f(x) = -3(x+h)^2 + (x+h) - (-3x^2 + x)$ $= -3(x^2 + 2xh + h^2) + x + h - (-3x^2 + x)$ $= -3x^2 - 6xh - 3h^2 + x + h + 3x^2 - x$ $= -6xh - 3h^2 + h$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{-6xh - 3h^2 + h}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-6x - 3h + 1)}{h}$ $= \lim_{h \rightarrow 0} (-6x - 3h + 1)$ $= -6x + 1$	<p>✓ substitution / <i>vervanging</i></p> <p>✓ expansion / <i>uitbreiding</i></p> <p>✓ simplification / <i>vereenvoudiging</i></p> <p>✓ factorisation / <i>faktorisering</i></p> <p>✓ answer / <i>antwoord</i></p> <p style="text-align: center;">OR/OF</p> <p>✓ substitution / <i>vervanging</i></p> <p>✓ expansion / <i>uitbreiding</i></p> <p>✓ simplification / <i>vereenvoudiging</i></p> <p>✓ factorisation / <i>faktorisering</i></p> <p>✓ answer / <i>antwoord</i></p> <p style="text-align: right;">(5)</p>
8.2.1	$D_x \left[3x^4 - \frac{4}{x^2} \right] = D_x \left[3x^4 - 4x^{-2} \right]$ $= 12x^3 + 8x^{-3}$	<p>✓ $-4x^{-2}$</p> <p>✓ $12x^3$ ✓ $+8x^{-3}$</p> <p style="text-align: right;">(3)</p>
8.2.2	$y = a^2x + 6\sqrt{x}$ $y = a^2x + 6x^{\frac{1}{2}}$ $\therefore \frac{dy}{dx} = a^2 + 3x^{-\frac{1}{2}}$	<p>✓ changing surd / <i>verandering van wortelvorm</i></p> <p>✓ a^2 ✓ $3x^{-\frac{1}{2}}$</p> <p style="text-align: right;">(3)</p>
[11]		

QUESTION 9/VRAAG 9

<p>9.1</p>	<p>$f(x) = -x^3 + 3x - 2$ $f'(x) = -3x^2 + 3$ At turning points / By draaipunte: $f'(x) = 0$ $-3x^2 + 3 = 0$ $x^2 = 1$ $\therefore x = \pm 1$</p> <p>$y = -(-1)^3 + 3(-1) - 2$ or / of $y = -(1)^3 + 3(1) - 2$ $= -4$ $= 0$</p> <p>\therefore Turning points / Draaipunte: $(-1; -4)$ and / en $(1; 0)$</p>	<p>✓ $f'(x) = -3x^2 + 3$ ✓ $f'(x) = 0$</p> <p>✓ $(-1; -4)$ ✓ $(1; 0)$</p> <p style="text-align: right;">(4)</p>
<p>9.2</p>	<p>$(1; 0)$ is an intercept / is 'n afsnit $f(x) = x^3 - 3x + 2 = (x - 1)(x^2 + x - 2)$ $= (x - 1)(x - 1)(x + 2)$ $x = 1$ or / of $x = -2$</p>	<p>✓ $(x - 1)(x^2 + x - 2)$ ✓ $(x - 1)(x + 2)$ ✓ values of x / waardes van x</p> <p style="text-align: right;">(3)</p>
<p>9.3.1</p>	<p>$-1 < x < 1$</p> <p style="text-align: center;">OR/OF</p> <p>$x \in (-1; 1)$</p>	<p>✓✓ $-1 < x < 1$</p> <p style="text-align: center;">OR/OF</p> <p>✓✓ $x \in (-1; 1)$</p> <p style="text-align: right;">(2)</p>
<p>9.3.2</p>	<p>$x_{p.o.i} = \frac{-1+1}{2} = 0$ OR / OF $f''(x) = 6x = 0$ $\Rightarrow x = 0$ \therefore concaved down for / konkaaf af vir : $x \leq 0$</p>	<p>✓ x-coordinate / x-koördinaat</p> <p>✓✓ answer / antwoord</p> <p style="text-align: right;">(3)</p>
<p>9.4</p>	<p>$g(x) = f(x - 3)$ Turning point / Draaipunt : $(-1; -4) \rightarrow (2; -4)$ $(1; 0) \rightarrow (4; 0)$ y-intercept / y-afsnit : $(-3)^3 - 3(-3) + 2 = -16$</p>	<p>✓ x-intercepts / x-afsnitte ✓ y-intercept / y-afsnit ✓ turning points / draaipunte ✓ shape / vorm</p> <p style="text-align: right;">(4)</p>
<p>9.5</p>	<p>$0 < k < 4$</p>	<p>✓✓ answer / antwoord (Accuracy / Akkuraatheid) (2)</p> <p style="text-align: right;">[18]</p>

QUESTION 11/VRAAG 11

11.1.1	$160 + 60 + x + 55 + 255 + 85 + 200 + 45 = 900$ $x = 900 - 860$ $x = 40$	✓ addition and equating to 900 / optel en gelyk stel aan 900 ✓ answers / antwoorde (2)
11.1.2	$P(\text{only / slegs } H) = \frac{200}{900} \left(= \frac{2}{9} \right)$	✓✓ answer / antwoord (2)
11.1.3	$P(\text{at least 2 / ten minste 2}) = \frac{240}{900}$ Percentage / Persentasie = 26,7%	✓✓ answer / antwoord (2)
11.2.1 (a)	$8! = 40\,320$ ways / maniere	✓ $8! = 40\,320$ (1)
11.2.2 (b)	$2 \times 7!$ ways / maniere $= 10\,080$ ways / maniere	✓ 2 ✓ 7! (award 2 nd mark only if multiplication is shown / answer only – full marks) (ken 2de punt toe slegs as vermenigvuldiging getoon word / slegs antwoord – volpunte) (2)
11.2.2	$P(\text{Event / Gebeurtenis}) = \frac{6! \times 3!}{8!}$ $= \frac{3}{28}$ <div style="border: 1px solid black; padding: 5px; display: inline-block; margin-top: 10px;"> Answer Only – Full Marks Slegs Antwoord – Volpunte </div>	✓ $6! \times 3!$ ✓ $8!$ (2)

11.3		
	$P(R/G) = P(R) \times P(G)$ $\frac{1}{5} = \frac{x}{4x} \times \frac{3x}{4x-1}$ $\frac{1}{5} = \frac{1}{4} \times \frac{3x}{4x-1}$ $\frac{4}{5} = \frac{3x}{4x-1}$ $15x = 16x - 4$ $x = 4$ $\therefore \text{Number of balls / Aantal balle} = 16$	$\checkmark \frac{x}{4x} \quad \checkmark \frac{3x}{4x-1}$ <p>\checkmark equating product to 0,2 <i>stel produk gelyk aan 0,2</i></p> <p>\checkmark value of x / waarde van x</p> <p>\checkmark answer / antwoord</p> <p style="text-align: right;">(5)</p>
		[16]

TOTAL/TOTAAL: 150