



LIMPOPO

PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

**NATIONAL SENIOR
CERTIFICATE/*NASIONALE
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GRADE/*GRAAD* 12

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SEPTEMBER 2024

MARKS/*PUNTE*: 150

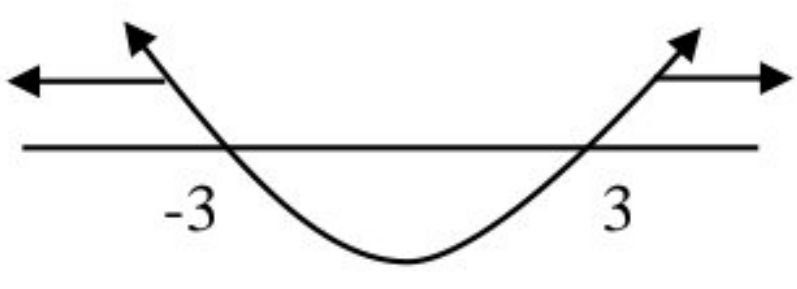
This marking guidelines consists of 17 pages/*Hierdie nasienriglyne bestaan uit 17 bladsye*

NSC – Marking Guidelines/Nasienriglyne

NOTE/NOTA:

- If a candidate answers a question TWICE, only mark the FIRST attempt/ *As 'n kandidaat 'n vraag twee keer beantwoord, merk slegs die EERSTE poging.*
- Consistent Accuracy applies in all aspects of the marking guidelines/ *Konsekwente akkuraatheid is van toepassing in alle aspekte van die nasienriglyne*

QUESTION/VRAAG 1

1.1	1.1.1	$x^2 - 3x + 2 = 0$ $(x - 2)(x - 1) = 0$ $x = 2$ or / of $x = 1$	✓ factorization/faktore ✓ $x = 2$ ✓ $x = 1$	(3)
	1.1.2	$3x^2 = -2 - 6x$ $3x^2 + 6x + 2 = 0$ $x = \frac{-(6) \pm \sqrt{(6)^2 - 4(3)(2)}}{2(3)}$ $\therefore x = -1,58$ or / of $x = -0,42$	✓ standard form /standard vorm ✓ subst into correct formula/subst in korrekte formule ✓ $x = -1,58$ ✓ $x = -0,42$	(4)
	1.1.3	$2x - 1 = \sqrt{1 - x}$ $(2x - 1)^2 = (\sqrt{1 - x})^2$ $4x^2 - 4x + 1 = 1 - x$ $4x^2 - 3x = 0$ $x(4x - 3) = 0$ $x = 0$ or / of $x = \frac{3}{4}$ $x = \frac{3}{4}$	✓ squaring both sides/ kwadreer albei kante ✓ standard form /standard vorm ✓ $x = 0$ or / of $x = \frac{3}{4}$ ✓ $x = \frac{3}{4}$	(4)
	1.1.4	$(x + 3)(3 - x) < 0$ $(x + 3)(x - 3) > 0$ CV: $x = -3$ or / of $x = 3$  $x < -3$ or / of $x > 3$	✓ critical values/kritieke waardes ✓✓ answer/antwoord	(3)

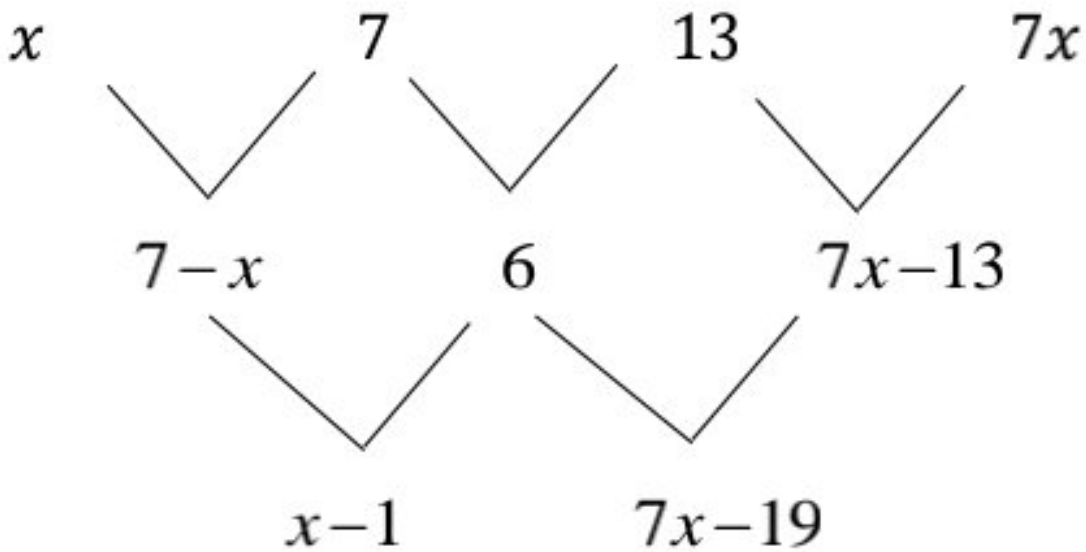
NSC – Marking Guidelines/Nasienriglyne

1.2	$2x = y + 2 \quad (1)$ $y - 2 = x^2 - 3x \quad (2)$ $y = 2x - 2$ Subst in (2) $2x - 2 - 2 = x^2 - 3x$ $2x - 4 = x^2 - 3x$ $x^2 - 5x + 4 = 0$ $(x - 1)(x - 4) = 0$ $x = 1 \quad \text{or / of} \quad x = 4$ $y = 0 \quad \text{or / of} \quad y = 6$ OR/OF $2x = y + 2 \quad (1)$ $y - 2 = x^2 - 3x \quad (2)$ $x = \frac{y + 2}{2}$ subst x in (2) $y - 2 = \left(\frac{y + 2}{2}\right)^2 - 3\left(\frac{y + 2}{2}\right)$ $y - 2 = \frac{y^2 + 4y + 4}{4} - \frac{3y - 6}{2}$ $4y - 8 = y^2 + 4y + 4 - 6y - 12$ $y^2 - 6y = 0$ $y = 0 \quad \text{or / of} \quad y = 6$ $x = 1 \quad \text{or / of} \quad x = 4$	$\checkmark y = 2x - 2$ $\checkmark \text{substitution / substitusie}$ $\checkmark \text{simplification/vereenvoudig}$ $\checkmark \text{standard form}$ $\quad \text{/standard vorm}$ $\checkmark x = 1 \quad \text{or / of} \quad x = 4$ $\checkmark y = 0 \quad \text{or / of} \quad y = 6$ OR/OF $\checkmark x = \frac{y + 2}{2}$ $\checkmark \text{substitution / substitusie}$ $\checkmark \text{simplification/vereenvoudig}$ $\checkmark \text{standard form}$ $\quad \text{/standard vorm}$ $\checkmark y = 0 \quad \text{or / of} \quad y = 6$ $\checkmark x = 1 \quad \text{or / of} \quad x = 4$	(6)
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1.3	$x = \frac{72}{t}$ $t = \frac{72}{x} \quad (1)$ $t - 0,2 = \frac{72}{x+5}$ $t = \frac{72}{x+5} + 0,2 \quad (2)$ equate (1) and (2) $\frac{72}{x} = \frac{72}{x+5} + 0,2$ $72(x+5) = 72x + 0,2x(x+5)$ $72x + 360 = 72x + 0,2x^2 + x$ $0,2x^2 + x - 360 = 0$ $x^2 + 5x - 1800 = 0$ $(x - 40)(x + 45) = 0$ $x = 40 \quad \text{or / of} \quad x = -45$ $x = 40 \text{ km / h}$	$\checkmark t = \frac{72}{x}$ $\checkmark t = \frac{72}{x+5} + 0,2$ $\checkmark \text{substitution / substitusie}$ $\checkmark \text{standard form}$ $\quad / \text{standard vorm}$ $\checkmark x = 40$	(5)
			[25]

QUESTIONVRAAG 2

2.1	2.1.1	$T_4: a + 3d = 5 \dots\dots\dots(1)$ $T_{14}: a + 13d = 15 \dots\dots\dots(2)$ $10d = 10$ $d = 1$	$\checkmark a + 3d = 5.$ $\checkmark a + 13d = 15$ $\checkmark 10d = 10$ $\checkmark \text{answer/antwoord}$	(4)
	2.1.2	$a = 2$ $T_n = a + (n-1)d$ $= 2 + (n-1)1$ $= n + 1$	$\checkmark a = 2$ $\checkmark T_n = n + 1$	(2)
	2.1.3	$S_n = \frac{n}{2}[2a + (n-1)d]$ $S_{22} = \frac{22}{2}[2(2) + (22-1)(1)]$ $= 11(25)$ $= 275$	$\checkmark \text{subst into correct formula/}$ $\text{subst in korrekte formule}$ $\checkmark \text{answer/antwoord}$	(2)
2.2		 $7x - 13 - 6 = 6 - (7 - x)$ $7x - 19 = -1 + x$ $6x = 18$ $x = 3$	$\checkmark \text{1st difference/1ste verskil}$ $\checkmark \text{2nd difference/2de verskil}$ $\checkmark \text{equation/vergelyking}$ $\checkmark \text{answer/antwoord}$	(4)
				[12]

QUESTION/VRAAG 3

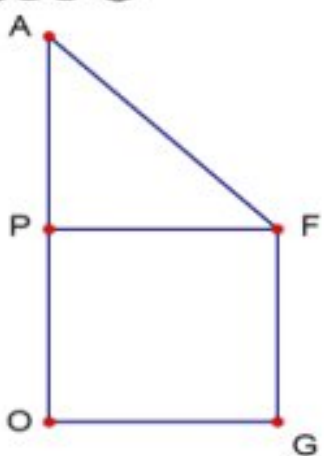
3.1	$S_{\infty} = \frac{a}{1-r}$ $= \frac{2}{1-\frac{1}{3}}$ $= 3$	$\checkmark r = \frac{1}{3}$ $\checkmark$ subst into correct formula <i>/subst in korrekte formule</i> $\checkmark$ answer/antwoord	(3)
3.2	$S_n = \frac{a(1-r^n)}{1-r}$ $S_n = \frac{2\left[1-\left(\frac{1}{3}\right)^n\right]}{1-\frac{1}{3}}$ $= \frac{2\left[1-\left(\frac{1}{3}\right)^n\right]}{\frac{2}{3}}$ $= 3\left[1-\left(\frac{1}{3}\right)^n\right]$ $= 3-3\left(\frac{1}{3}\right)^n$	$\checkmark$ subst into correct formula <i>/subst in korrekte formule</i> $\checkmark \frac{2\left[1-\left(\frac{1}{3}\right)^n\right]}{\frac{2}{3}}$ $\checkmark 3\left[1-\left(\frac{1}{3}\right)^n\right]$	(3)
3.3	$3-3\left(\frac{1}{3}\right)^n > 2,99$ $\left(\frac{1}{3}\right)^n < \frac{0,01}{3}$ $n \log \frac{1}{3} < \log \frac{0,01}{3}$ $n > \frac{\log \frac{0,01}{3}}{\log \frac{1}{3}}$ $n > 5,19$ Smallest value of/Kleinste waarde van n is 5	$\checkmark 3-3\left(\frac{1}{3}\right)^n > 2,99$ $\checkmark$ simplification/vereenvoudig $\checkmark$ use of logs/gebruik logs $\checkmark n > 5,19$ $\checkmark$ reasoning/redenasie	(5)
			[11]

NSC – Marking Guidelines/Nasienriglyne

QUESTION/VRAAG 4

4.1	4.1.1	$f(x) = -x^2 + x + 12$ y – intercept/afsnit ($x = 0$) $y = 12$ $A(0; 12)$ $-x^2 + x + 12 = 0$ $x^2 - x - 12 = 0$ $(x - 4)(x + 3) = 0$ $x = 4$ or / of $x = -3$ $B(4; 0)$	$\checkmark$ equate to 0/gelykstel 0 $\checkmark x = 4$ or / of $x = -3$	(2)
	4.1.2	$y = mx + k$ $y = mx + 12$ Passing through/Gaan deur $B(4; 0)$ $4m + 12 = 0$ $m = -3$ $y = -3x + 12$ OR/OF $m = \frac{12 - 0}{0 - 4}$ $= -3$ $y = mx + k$ $B(4; 0)$ $0 = -3(4) + k$ $\therefore k = 12$ $y = -3x + 12$	$\checkmark k = 12$ $\checkmark$ substitution / substitusie $\checkmark m = -3$ OR/OF $\checkmark m = -3$ $\checkmark$ substitution / substitusie $\checkmark k = 12$	(3)
	4.1.3	(a) $EF = EG - FG$ $= (-x^2 + x + 12) - (-3x + 12)$ $= [-(2)^2 + (2) + 12] - [-3(2) + 12]$ $EF = 4$ units / eenhede OR/OF $EF = (-x^2 + x + 12) - (-3x + 12)$ $= -x^2 + 4x$ $= -(2)^2 + 4(2)$ $\therefore EF = 4$ units / eenhede	$\checkmark$ substitution / substitusie $\checkmark$ answer/antwoord OR/OF $\checkmark$ substitution / substitusie $\checkmark$ answer/antwoord	(2)

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		(b)	Area of / <i>Opv van</i> AOGF construct / <i>konstrueer</i> : PF / /OG = Area $\triangle APF$ + Area OPFG $= \frac{1}{2}(2)(3) + (6 \times 2)$ $= 18$  OR/OF AOGF is a trapezium Area / <i>Opv</i> = $\frac{1}{2}(FG + AO)h$ $= \frac{1}{2}(6 + 12)2$ $= 18$ OR/OF Area of / <i>opv van</i> AOGF = Area ($\triangle AOB - \triangle GBF$) $= \frac{1}{2}(4)(12) - \frac{1}{2}(2)(6)$ $= 18$	✓ $\frac{1}{2}(2)(3)$ ✓ (6×2) ✓ answer/antwoord OR/OF ✓ $(6 + 12)$ ✓ 2 ✓ answer/antwoord OR/OF ✓ $\frac{1}{2}(4)(12)$ ✓ $\frac{1}{2}(2)(6)$ ✓ answer/antwoord	(3) (3) (3)
	4.1.4		C(-3;0) $f'(x) = -2x + 1$ $f'(-3) = -2(-3) + 1$ $= 7$ $y - 0 = 7(x + 3)$ $y = 7x + 21$ $7x + 21 = -3x + 12$ $10x = -9$ $x = -0,9$ $y = 14,7$	✓ $f'(x) = -2x + 1$ ✓ $m = 7$ ✓ $y = 7x + 21$ ✓ $7x + 21 = -3x + 12$ ✓ $x = -0,9$ ✓ $y = 14,7$	(6)
	4.1.5		$x < -3$ or $-\frac{1}{2} < x < 4$	✓ $x < -3$ ✓✓ $-\frac{1}{2} < x < 4$	(3)

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QUESTION/VRAAG 5

5.1	$h(x) = \log_a x$ Passing though/ <i>gaan deur</i> (16; 4) $4 = \log_a 16$ $a^4 = 16$ $a = 2$	✓ substitution / <i>substitusie</i> ✓ change to exponents/ <i>vernader na eksponente</i> ✓ answer/ <i>antwoord</i>	(3)
5.2	$y = \log_2 x$ $2^y = x$ $x = 2^0$ $x = 1$ $B(1; 0)$	✓ $B(1; 0)$	(1)
5.3	$y = \log_2 x$ $x = \log_2 y$ $y = 2^x$ $\therefore h^{-1}(x) = 2^x$	✓ interchanging/ <i>ruil x & y</i> ✓ $h^{-1}(x) = 2^x$	(2)
5.4	Range / <i>waardeversameling</i> : $y > 0$ OR/OF $y \in (0 ; \infty)$	✓ $y > 0$ OR/OF $y \in (0 ; \infty)$	(1) (1)
			[7]

QUESTION/VRAAG 6

6.1	$1 + i_{eff} = \left(1 + \frac{0,115}{4}\right)^4$ $1 + i_{eff} = 1,120055$ $i_{eff} = 0,1200$ $\therefore \text{rate / koers} = 12\%$	✓ subst in correct formula / <i>subst in korrekte formule</i> ✓ $\frac{0,115}{4}$ ✓ answer/antwoord	(3)
6.2	$A = 200\,000 \left(1 + \frac{11,5}{400}\right)^{40}$ $= R621\,475,37$	✓ $n = 40$ ✓ answer/antwoord	(2)
6.3	Loan amount/ <i>Lening bedrag</i> = $1\,850\,000 - 621\,475,37$ $= R1\,228\,524,63$	✓ Loan/ <i>lening</i> ✓ answer/antwoord	(2)
6.4	$P = \frac{x[1 - (1+i)^{-n}]}{i}$ $1\,228\,524,63 = \frac{x \left[1 - \left(1 + \frac{12}{1200}\right)^{-300}\right]}{\frac{12}{1200}}$ $1\,228\,524,63 = 94,94655125x$ $x = 12\,939,12$	✓ $n = -300$ ✓ subst in correct formula / <i>subst in korrekte formule</i> ✓ $\frac{12}{1200}$ ✓ answer/antwoord	(4)
6.5	Balance / <i>Balans</i> = $\frac{x[1 - (1+i)^{-n}]}{i}$ $\frac{12\,939,12 \left[1 - \left(1 + \frac{12}{1200}\right)^{-120}\right]}{3}$ $= R901\,863,28$ OR/OF	✓ $n = -120$ ✓ subst in correct formula / <i>subst in korrekte formule</i> ✓ answer/antwoord OR/OF	(3)

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	Balance / <i>Balans</i> = A – F $= 1\,228\,524,63 \left(1 + \frac{12}{1200}\right)^{180} - \frac{12\,939,12 \left[\left(1 + \frac{12}{1200}\right)^{180} - 1 \right]}{\frac{12}{1200}}$ = 901 863,28	✓ subst in compound formula/<i>vervang in saamgestelde formule</i> ✓ subst in Future value/<i>vervang in toekomstige formule</i> ✓ answer/<i>antwoord</i>	(3)
6.6	Interest/<i>Rente</i> $= 12\,939,12 \times 300 - 1\,228\,524,63$ = R2 653 210,76	✓ calculation/<i>bewerking</i> ✓ answer/<i>antwoord</i>	(2)
			[16]

QUESTION/VRAAG 7

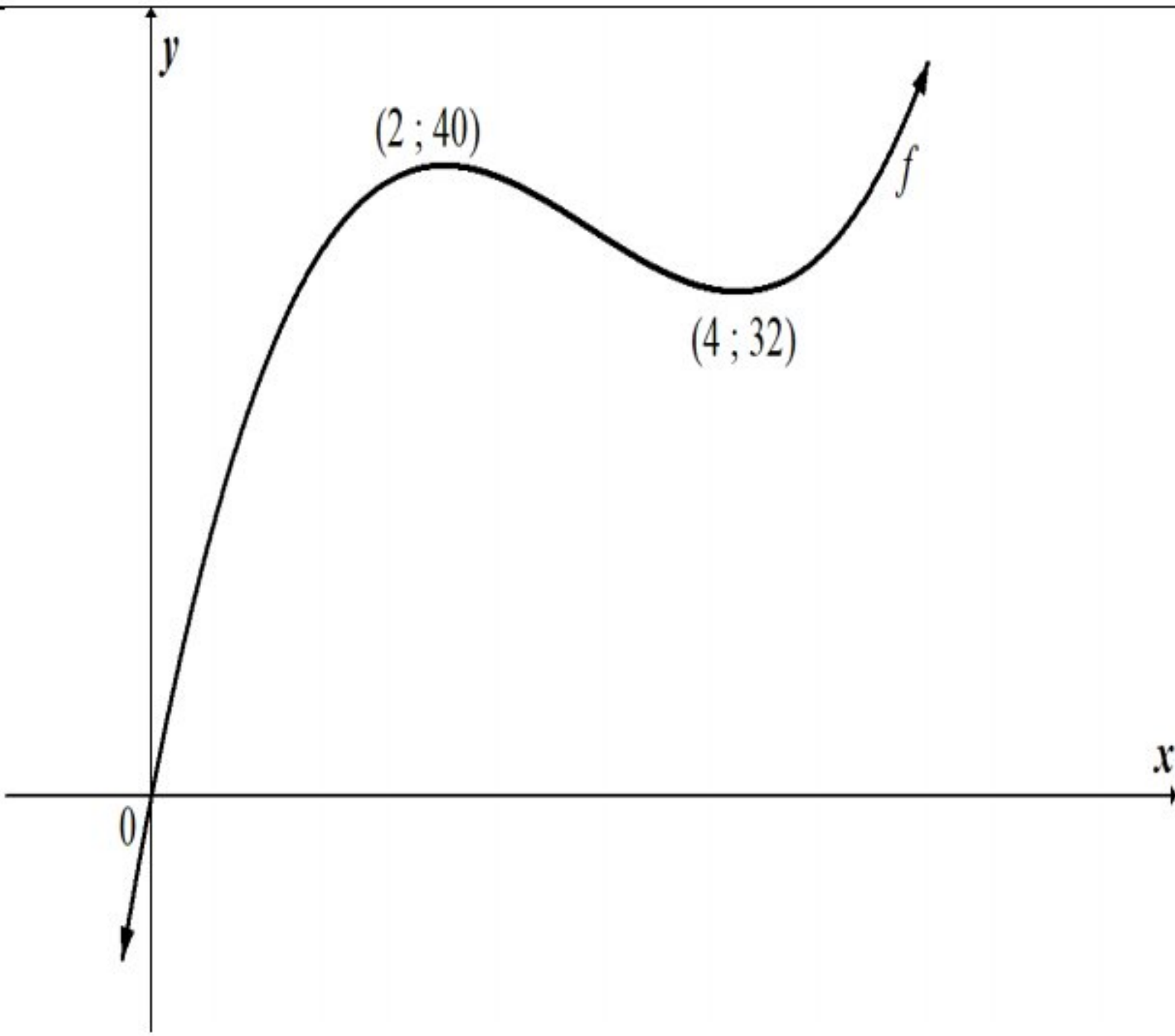
7.1	$f(x) = 3x^2$ $f(x+h) = 3(x+h)^2 = 3x^2 + 6xh + 3h^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{3x^2 + 6xh + 3h^2 - 3x^2}{h}$ $= \lim_{h \rightarrow 0} \frac{6xh + 3h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(6x + 3h)}{h}$ $= \lim_{h \rightarrow 0} \frac{6x + 3h}{1}$ $= 6x$ OR/OF $f(x) = 3x^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{3(x+h)^2 - 3x^2}{h}$ $= \lim_{h \rightarrow 0} \frac{3x^2 + 6xh + 3h^2 - 3x^2}{h}$ $= \lim_{h \rightarrow 0} \frac{6xh + 3h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(6x + 3h)}{h}$ $= \lim_{h \rightarrow 0} (6x + 3h)$ $= 6x$	$\checkmark 3x^2 + 6xh + 3h^2$ $\checkmark$ substitution / <i>substitusie</i> $\checkmark \lim_{h \rightarrow 0} \frac{6xh + 3h^2}{h}$ $\checkmark \lim_{h \rightarrow 0} \frac{h(6x + 3h)}{h}$ $\checkmark \lim_{h \rightarrow 0} (6x + 3h)$ $\checkmark$ answer/antwoord OR/OF $\checkmark$ substitution / <i>substitusie</i> $\checkmark 3x^2 + 6xh + 3h^2$ $\checkmark \lim_{h \rightarrow 0} \frac{6xh + 3h^2}{h}$ $\checkmark \lim_{h \rightarrow 0} \frac{h(6x + 3h)}{h}$ $\checkmark \lim_{h \rightarrow 0} (6x + 3h)$ $\checkmark$ answer/antwoord	(5)
7.2.1	$f(x) = (x-1)(x^6 + x^5 + x^4 + x^3 + x^2 + x + 1)$ $= x^7 + x^6 + x^5 + x^4 + x^3 + x^2 + x$ $- x^6 - x^5 - x^4 - x^3 - x^2 - x - 1$ $= x^7 - 1$ $f'(x) = 7x^6$	$\checkmark$ products/produkte $\checkmark x^7 - 1$ $\checkmark 7x^6$	(3)

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	7.2.2	$D_x \left[\frac{x^3 + 2x^2 + x}{x+1} \right]$ $= D_x \left[\frac{x(x+1)(x+1)}{x+1} \right]$ $= D_x [x^2 + x]$ $= 2x + 1$	✓ simplification/ <i>vereenvoudig</i> ✓ $x^2 + x$ ✓ $2x$ ✓ 1	(4)
	7.2.3	$y = \sqrt[3]{x} - \frac{1}{3x}$ $= x^{\frac{1}{3}} - \frac{1}{3}x^{-1}$ $\frac{dy}{dx} = \frac{1}{3}x^{\frac{-2}{3}} + \frac{1}{3}x^{-2}$	✓ $x^{\frac{1}{3}}$ ✓ $-\frac{1}{3}x^{-1}$ ✓ $\frac{1}{3}x^{\frac{-2}{3}}$ ✓ $\frac{1}{3}x^{-2}$	(4)
				[16]

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QUESTION/VRAAG 8

8.1	$f(3) = 2(3)[(3)^2 - 9(3) + 24]$ $= 36$	✓ substitution / <i>substitusie</i> ✓ answer/antwoord	(2)
8.2	$f(x) = 2x^3 - 18x^2 + 48x$ $f'(x) = 6x^2 - 36x + 48$ $6x^2 - 36x + 48 = 0$ $x^2 - 6x + 8 = 0$ $(x - 4)(x - 2) = 0$ $x = 4$ or / of $x = 2$ $y = 32$ or / of $y = 40$	✓ derivative/afgeleide ✓ standard form /standard vorm ✓ x – values/waardes ✓ y – values/waardes	(4)
8.3		✓ shape/vorm ✓ turning points/ <i>draaipunte</i> ✓ origin/oorsprong	(3)
8.4	$32 < k < 40$	✓✓ answer/antwoord	(2)
8.5	Maximum/Maksimum is 40	✓ max/maks 40	(1)
			[12]

NSC – Marking Guidelines/Nasienriglyne

QUESTION/VRAAG 9

9.1	$A = \pi R^2 + \pi r^2 \dots\dots\dots(1)$ $R + r = 200$ $r = 200 - R \dots\dots\dots(2)$ Subst (2) in (1) $A = \pi R^2 + \pi(200 - R)^2$ $= \pi R^2 + \pi(40000 - 400R + R^2)$ $= \pi R^2 + 40000\pi - 400\pi R + \pi R^2$ $= 2\pi R^2 - 400\pi R + 40000\pi$	✓ Equation of A/ <i>Vergelyking A</i> ✓ r subject of formula/ r <i>onderwerp formule</i> ✓ substitution / <i>substitusie</i>	(3)
9.2	At minimum $\frac{dA}{dR} = 0$ $4\pi R - 400\pi = 0$ $R = \frac{400\pi}{4\pi}$ $R = 100$ $r = 200 - R = 100$	✓ $\frac{dA}{dR} = 0$ ✓ $4\pi R - 400\pi$ ✓ $R = 100$ ✓ $r = 100$	(4)
9.3	$R = r = 100$, will not get the desired shape because a shape with two equal circles touch externally / <i>sal nie die gewenste vorm kry nie, want 'n vorm met twee gelyke sirkels raak ekstern</i>	✓✓ valid explanation/ <i>geldige verduideliking</i>	(2)
			[9]

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QUESTION/VRAAG 10

10.1		$P(A \text{ or / of } B) = P(A) + P(B)$ $= 0,45 + 0,25$ $= 0,7$	✓ $0,45 + 0,25$ ✓ answer/antwoord	(2)
10.2	10.2.1		✓ $\frac{20}{50}$ and / en $\frac{30}{50}$ ✓ $\frac{29}{49}$ and / en $\frac{20}{49}$ ✓ $\frac{30}{49}$ and / en $\frac{19}{49}$	(3)
	10.2.2	$P(NC) = \left(\frac{30}{50} \times \frac{20}{49}\right) + \left(\frac{20}{50} \times \frac{30}{49}\right)$ $= 0,41$	✓ $\left(\frac{30}{50} \times \frac{20}{49}\right)$ ✓ $\left(\frac{20}{50} \times \frac{30}{49}\right)$ ✓ answer/antwoord	(3)
	10.2.3	$P(CC) = \frac{30}{50} \times \frac{29}{49}$ $= 0,36$	✓ $\frac{30}{50} \times \frac{29}{49}$ ✓ answer/antwoord	(2)
10.3	10.3.1	$10^3 \times 5^2$ $= 25000$	✓ $10^3 \times 5^2$ ✓ answer/antwoord	(2)
	10.3.2	$9 \times 9 \times 8 \times 4 \times 1$ $= 12960$	✓ $9 \times 9 \times 8$ ✓ 4×1 ✓ answer/antwoord	(3)
				[15]

TOTAL/TOTAAL: 150