basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NASIONALE SENIOR SERTIFIKAAT

GRAAD 12

WISKUNDE V1

NOVEMBER 2025

PUNTE: 150

TYD: 3 uur

Hierdie vraestel bestaan uit 11 bladsye, 1 inligtingsblad en 'n antwoordeboek van 23 bladsye.

INSTRUKSIES EN INLIGTING

Lees die volgende instruksies en inligting noukeurig deur voordat die vrae beantwoord word.

1. Hierdie vraestel bestaan uit 11 vrae.
2. Beantwoord AL die vrae in die SPESIALE ANTWOORDEBOEK wat verskaf word.
3. Dui ALLE berekeninge, diagramme, grafieke, ens. wat jy gebruik het om jou antwoorde te bepaal, duidelik aan.
4. Volpunte sal NIE noodwendig aan slegs antwoorde toegeken word NIE.
5. Jy mag 'n goedgekeurde wetenskaplike sakrekenaar (nieprogrammeerbaar en niegrafies) gebruik, tensy anders vermeld.
6. Indien nodig, rond antwoorde tot TWEE desimale plekke af, tensy anders vermeld.
7. Diagramme is NIE noodwendig volgens skaal geteken NIE.
8. 'n Inligtingsblad met formules is aan die einde van die vraestel ingesluit.
9. Skryf netjies en leesbaar.

VRAAG 1

1.1 Los op vir x:

1.1.1 $(x+5)(x-2)=0$ (2)

1.1.2 $5x^2+2=-9x$ (korrek tot TWEE desimale plekke) (4)

1.1.3 $8x^2>2x$ (4)

1.1.4 $2.2^{2x}-9.2^x+4=0$ (4)

1.1.5 $\sqrt{\sqrt{\frac{1}{x}}+2}=\frac{1}{\sqrt{x}}$ (5)

1.2 Bereken die waardes van x en y indien:

- x die som van 2 en y is
- Vyf keer die produk van x en y, 6 meer as die kwadraat van x is (6)

[25]

VRAAG 2

2.1 Gegee die oneindige meetkundige reeks: $(t+10)+(t-2)+(t+4)+\ldots$

2.1.1 Dui aan dat $t=-2$ (3)

2.1.2 Bereken die waarde van T_{25}. Skryf jou antwoord in die vorm $T_n=b^x$ (3)

2.1.3 Bereken die som van die oneindige reeks. (2)

2.2 Gegee $\sum_{p=k}^{117}(4p-1)=26\,675$

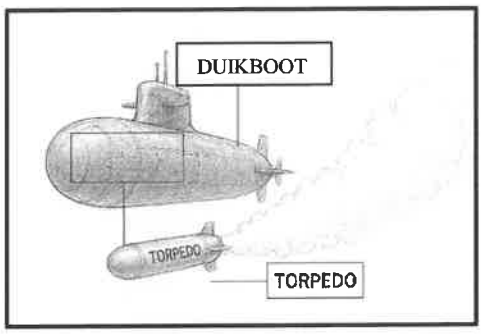
2.2.1 Skryf die verskil tussen T_6 en T_{14} neer. (2)

2.2.2 Bereken die waarde van k. (5)

[15]

VRAAG 3

Die diepte van 'n torpedo onder seevlak vorm 'n kwadratiese patroon, waar 0 meter by seevlak is. 'n Duikboot het 'n torpedo met intervalle van een sekonde elk gevolg.



Die diepte (in meter) wat die torpedo bereik het, word in die tabel hieronder gegee.

	Diepte (in meter)
Aan die einde van die eerste sekonde	36
Aan die einde van die eerste 2 sekondes	71
Aan die einde van die eerste 3 sekondes	104

3.1 Bereken die diepte van die torpedo aan die einde van die eerste 5 sekondes. (2)

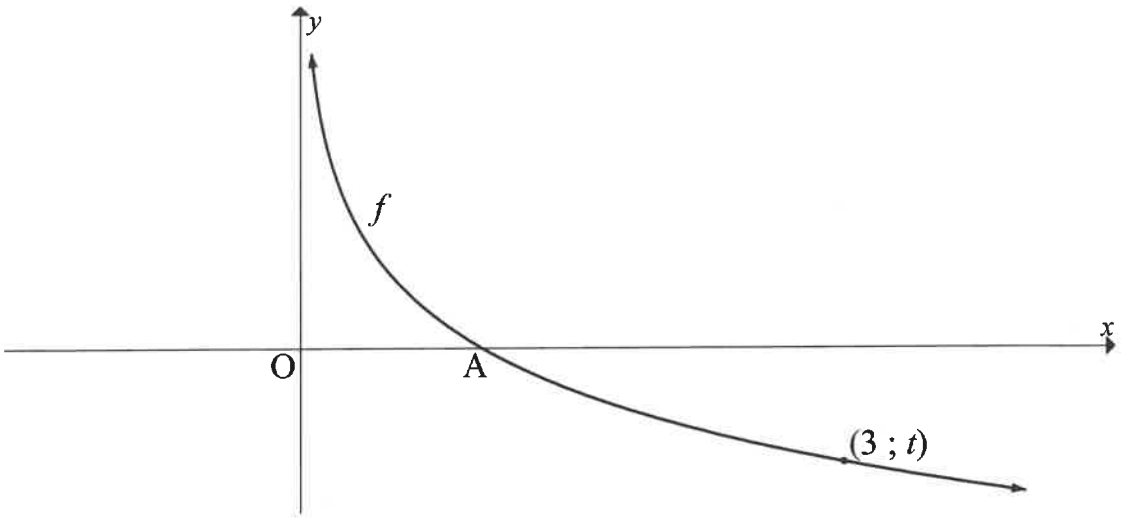
3.2 Toon dat die diepte van die torpedo aan die einde van n sekondes $T_n = -n^2 + 38n - 1$ was. (3)

3.3 Bereken die maksimum diepte wat die torpedo bereik het. (3)

3.4 Na hoeveel sekondes was die torpedo vir die tweede keer op 104 m onder seevlak? (2)
[10]

VRAAG 4

Die grafiek van $f(x)=\log_{\frac{1}{3}} x$ is hieronder geskets. Punt A is die x-afsnit van f en $(3\ ;\ t)$ is op f.



4.1 Bepaal die waarde van t (1)

4.2 Skryf die koördinate van A neer. (1)

4.3 Bepaal die vergelyking van f^{-1}, die inverse van f, in die formaat $y=\ldots$ (2)

4.4 Skryf die vergelyking van die asimptoot van f^{-1} neer. (1)

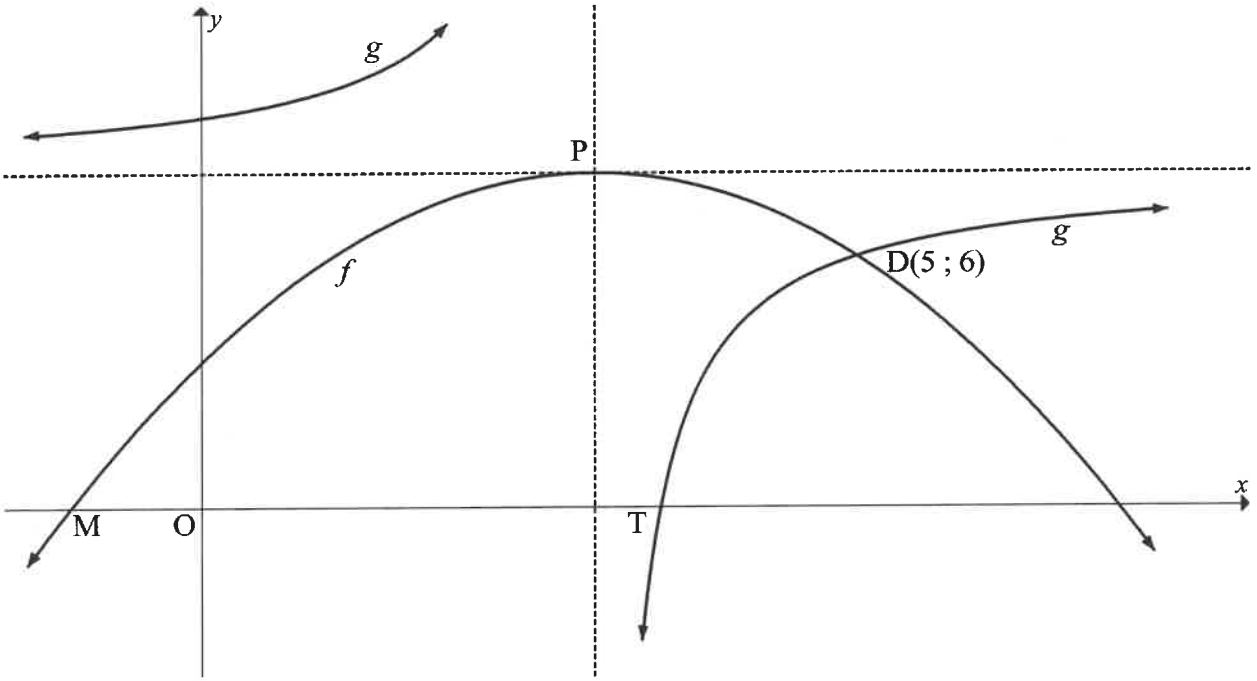
4.5 Skets die grafiek van f^{-1} op die assestelsel wat in die ANTWOORDEBOEK verskaf word. Dui duidelik die afsnitte met die asse, die koördinate van EEN ander punt en die asimptote aan. (3)

4.6 Die grafiek van h word verkry indien f^{-1} 'n translasie van 5 eenhede na regs ondergaan. Bepaal die y-waardes van h waar $x>4$. (2)
[10]

VRAAG 5

Die grafieke van $f(x)=ax^2+bx+c$ en $g(x)=\frac{-4}{x-3}+8$ is hieronder geskets.

P is die draaipunt van f sowel as die snypunt van die asimptote van g.
Die grafieke sny mekaar by D(5 ; 6). M en T is x-afsnitte van f en g respektiewelik.



5.1 Skryf die definisieversameling van g neer. (1)

5.2 Skryf die waardeversameling van f neer. (1)

5.3 Bepaal die waardes van x waarvoor:

5.3.1 $g(x) \leq f(x)$ (2)

5.3.2 $f(x) < 6$ (2)

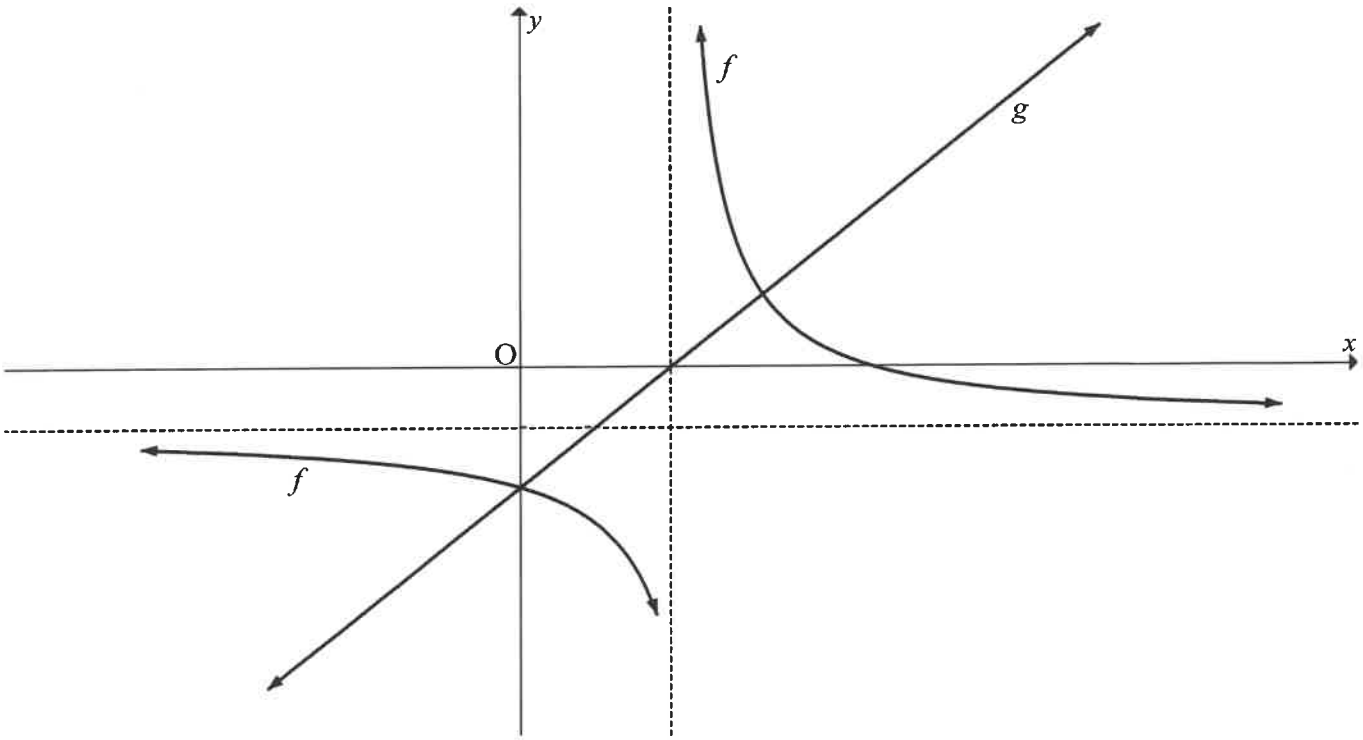
5.4 Toon dat die vergelyking van die parabool $f(x)=-\frac{1}{2}x^2+3x+\frac{7}{2}$ is. (3)

5.5 Bereken die lengte van MT. (6)

5.6 Bepaal die vergelyking van die raaklyn aan f by D. (3)
[18]

VRAAG 6

Die grafieke van $g(x) = x + c$ en $f(x) = \frac{a}{x+p} + q$ is hieronder geskets. Grafiek g en die vertikale asimptoot van f sny mekaar op die x-as.



6.1 Skryf die koördinate van die x-afsnit van g in terme van p neer. (1)

6.2 Grafiek g sny die horisontale asimptoot van grafiek f by $x = 1$ en die grafiek f by $x = 3$. Grafieke f en g sny mekaar ook op die y-as. Bepaal die vergelyking van f. (5)

6.3 Beskryf die transformasie wat g moet ondergaan om 'n simmetrie-as van f te word wat f op twee punte sny. (2)
[8]

VRAAG 7

7.1 'n Reisagentskap lig Robert in dat 'n vakansie na 'n spesifieke bestemming nou R40 000 kos. Die agentskap voorspel dat die koste van hierdie vakansie jaarliks met 7,8% sal verhoog. Wat sal hierdie vakansie oor 5 jaar kos? (2)

7.2 Sarah het 'n spaarrekening oopgemaak wat rente teen 5,8% p.j., kwartaalliks saamgestel, betaal. Sy het op 1 Januarie 2020, R2 300 in die rekening gedeponeer en voortgegaan om deposito's van R2 300 aan die begin van elke kwartaal daarna te maak. Sy het haar laaste deposito op 1 Oktober 2025 gemaak. Bereken die totale bedrag in die rekening op 1 Januarie 2026. (4)

7.3 Die bank het op 28 Februarie 2024 'n lening van R900 000 vir Rajesh toegestaan teen 'n rentekoers van 6,8% p.j., maandeliks saamgestel.

7.3.1 Rajesh kon nie die eerste drie betalings maak nie. Hy het op 30 Junie 2024 sy eerste terugbetaling van R10 000 gemaak. Hy het voortgegaan om aan die einde van elke maand daarna maandelikse terugbetalings van R10 000 te maak. Hoe lank, in volle maande, sal dit Rajesh neem om die lening terug te betaal vanaf die tyd wat die lening goedgekeur is? (5)

7.3.2 Bereken die waarde van die finale betaling. (4)

[15]

VRAAG 8

8.1 Bepaal $f'(x)$ vanuit eerste beginsels indien dit gegee word dat $f(x) = -2x + 3$. (4)

8.2 Bepaal:

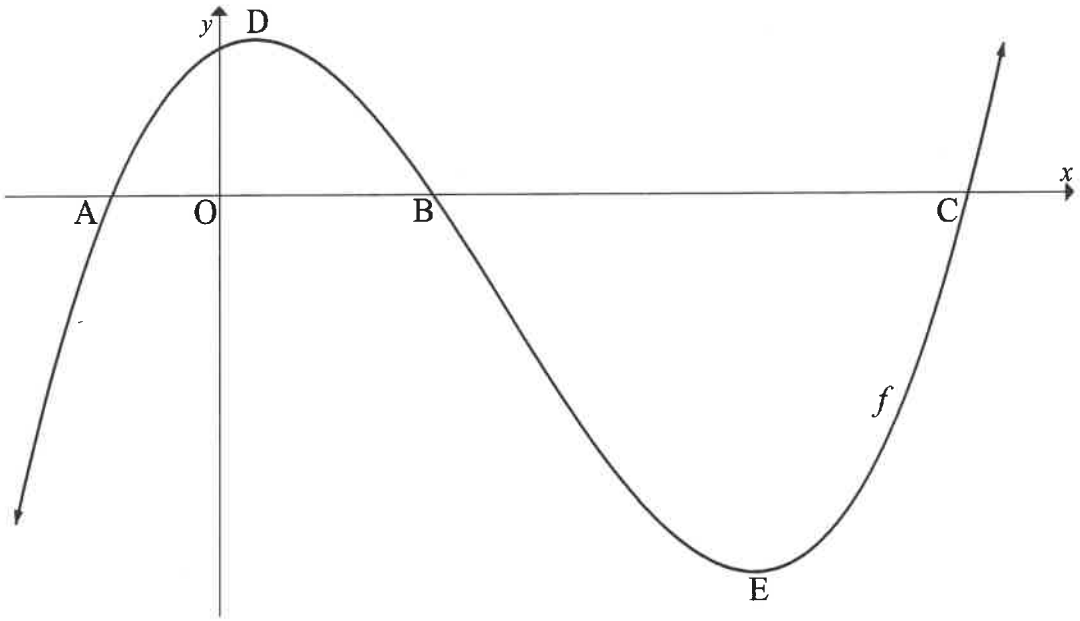
8.2.1 $g'(x)$ indien $g(x) = -3x^4 + 2x$ (2)

8.2.2 $\frac{dy}{dx}$ indien $y = \frac{2x^4 + 1}{x^2}$ (4)

[10]

VRAAG 9

Die grafiek van $f(x)=x^3-8x^2+5x+14$ is hieronder geskets. A, B en C is die x–afsnitte van f. D en E is die draaipunte van f.



9.1 Bereken die koördinate van E. (4)

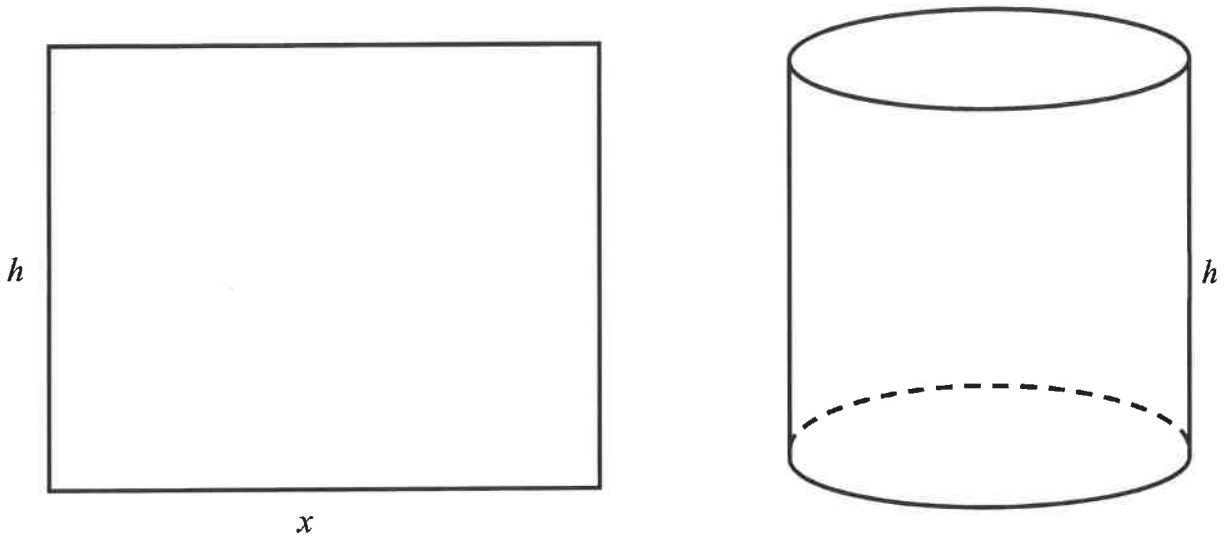
9.2 Vir watter waardes van x is f konkaaf na onder? (3)

9.3 Die koördinate van B is (2 ; 0). Gebruik die grafiek om die waardes van x te bepaal waarvoor $f(x).f''(x)<0$ (4)

9.4 Vir watter waardes van t sal $y=-11x+t$ die grafiek van f by 3 verskillende punte sny? (6)
[17]

VRAAG 10

'n Reghoekige metaalplaat het afmetings van x en h eenhede, met $x > h$, en 'n omtrek van 50 eenhede. Die metaalplaat word in 'n silinder gerol met twee oop kante (bo en onder) en hoogte h eenhede.



10.1 Toon dat die volume van die silinder deur $V = \frac{25x^2}{4\pi} - \frac{x^3}{4\pi}$ gegee word. (3)

10.2 Bereken die waarde van x wat die volume van die silinder sal maksimeer. (3)
[6]

VRAAG 11

11.1 'n Opname is onder vroulike en manlike leerders by 'n skool gedoen oor watter tipe koeldrank hulle verkies. Die data van die opname word in die tabel hieronder gegee.

	SAP	**ENERGIEDRANKIES**	**TOTAAL**
Vroulik	***a***	***b***	***c***
Manlik	36	54	***f***
Totaal	***e***	***d***	210

11.1.1 Die gebeurtenisse manlik en verkies sap is onafhanklik. Toon dat $e = 84$. (3)

11.1.2 Bereken die waarskynlikheid dat 'n vroulike leerder, willekeurig uit die groep gekies, van energiedrankies sal hou. (3)

11.2 By 'n kiosk koop 120 persone óf 'n koppie koffie óf 'n bottel water. Die moontlikheid vir reën op enige gegewe dag is 75%. Die moontlikheid dat 'n persoon 'n koppie koffie op 'n reënerige dag sal koop, is drie keer die moontlikheid dat 'n persoon koffie op 'n nie-reënerige dag sal koop.

Die waarskynlikheid dat 'n persoon koffie op enige gegewe dag sal koop, is $\frac{7}{12}$.

Bereken die getal koppies koffie wat op 'n nie-reënerige dag verkoop sal word. (4)

11.3 Agt deelnemers neem aan 'n wedloop deel waar daar geen gelykop-uitslag is nie. Bongi en Andrew is twee van die deelnemers.

11.3.1 Bereken die totale getal moontlike maniere waarop die 8 deelnemers die wedloop kan voltooi indien Bongi in 'n posisie direk ná Andrew eindig. (2)

11.3.2 Bereken die waarskynlikheid dat TWEE OF MEER deelnemers die wedloop ná Andrew en voor Bongi sal voltooi. (4)

[16]

TOTAAL: 150

INLIGTINGSBLAD

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

$$A = P(1+ni) \qquad A = P(1-ni) \qquad A = P(1-i)^n \qquad A = P(1+i)^n$$

$$T_n = a + (n-1)d \qquad S_n = \frac{n}{2}\left[2a + (n-1)d\right]$$

$$T_n = ar^{n-1} \qquad S_n = \frac{a(r^n - 1)}{r-1} \;; r \neq 1 \qquad S_\infty = \frac{a}{1-r} \;; -1 < r < 1$$

$$F = \frac{x\left[(1+i)^n - 1\right]}{i} \qquad P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$$

$$f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2} \qquad \mathrm{M}\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c \qquad y - y_1 = m(x - x_1) \qquad m = \frac{y_2 - y_1}{x_2 - x_1} \qquad m = \tan\theta$$

$$(x-a)^2 + (y-b)^2 = r^2$$

In ΔABC: $\dfrac{a}{\sin A} = \dfrac{b}{\sin B} = \dfrac{c}{\sin C}$

$$a^2 = b^2 + c^2 - 2bc.\cos A$$

$$\text{area } \Delta ABC = \frac{1}{2}ab.\sin C$$

$$\sin(\alpha + \beta) = \sin\alpha.\cos\beta + \cos\alpha.\sin\beta \qquad \sin(\alpha - \beta) = \sin\alpha.\cos\beta - \cos\alpha.\sin\beta$$

$$\cos(\alpha + \beta) = \cos\alpha.\cos\beta - \sin\alpha.\sin\beta \qquad \cos(\alpha - \beta) = \cos\alpha.\cos\beta + \sin\alpha.\sin\beta$$

$$\cos 2\alpha = \begin{cases} \cos^2\alpha - \sin^2\alpha \\ 1 - 2\sin^2\alpha \\ 2\cos^2\alpha - 1 \end{cases} \qquad \sin 2\alpha = 2\sin\alpha.\cos\alpha$$

$$\bar{x} = \frac{\sum_{i=1}^{n} x_i}{n} \qquad \sigma^2 = \frac{\sum_{i=1}^{n} (x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)} \qquad P(A \text{ of } B) = P(A) + P(B) - P(A \text{ en } B)$$

$$\hat{y} = a + bx \qquad b = \frac{\sum (x - \bar{x})(y - \bar{y})}{\sum (x - \bar{x})^2}$$

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NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE 12/*GRAAD 12*

MATHEMATICS P1/*WISKUNDE V1*

NOVEMBER 2025

MARKING GUIDELINES/*NASIENRIGLYNE*

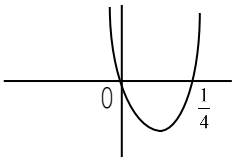
MARKS/*PUNTE*: 150

These marking guidelines consist of 21 pages.
Hierdie nasienriglyne bestaan uit 21 bladsye.

NOTE:
- If a candidate answers a question TWICE, only mark the FIRST attempt.
- Consistent Accuracy applies in all aspects of the marking guidelines.

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

QUESTION 1/*VRAAG* 1

1.1.1	$(x+5)(x-2)=0$ $x=-5$ or $x=2$	✓ $x=-5$ ✓ $x=2$ (2)
1.1.2	$5x^2+2=-9x$ $5x^2+9x+2=0$ $x=\dfrac{-9\pm\sqrt{(9^2)-4(5)(2)}}{2(5)}$ $x=\dfrac{-9\pm\sqrt{41}}{10}$ $x=-0,26$ or $x=-1,54$	✓ standard form ✓ substitution into the correct formula ✓ answer ✓ answer (4)
1.1.3	$8x^2>2x$ $8x^2-2x>0$ $2x(4x-1)>0$ CV: 0 ; $\frac{1}{4}$  $x<0$ or $x>\dfrac{1}{4}$	✓ standard form ✓ critical values/factors ✓✓ answer (4)
1.1.4	$2.2^{2x}-9.2^x+4=0$ $(2.2^x-1)(2^x-4)=0$ $2^x=\dfrac{1}{2}$ or $2^x=4$ $2^x=2^{-1}$ $2^x=2^2$ $x=-1$ $x=2$	✓factors ✓ both equations ✓ answer ✓ answer (4)

	OR/*OF* $2.2^{2x}-9.2^{x}+4=0$ Let $k=2^{x}$ $2k^{2}-9k+4=0$ $(2k-1)(k-4)=0$ $k=\frac{1}{2}$ or $k=4$ $\therefore 2^{x}=\frac{1}{2}$ or $2^{x}=4$ $\therefore x=-1$ or $x=2$	**OR/*OF*** ✓factors ✓ both equations ✓ answer ✓ answer (4)
1.1.5	$\sqrt{\sqrt{\frac{1}{x}+2}}=\frac{1}{\sqrt{x}}$ $\left(\sqrt{\sqrt{\frac{1}{x}+2}}\right)^{2}=\left(\frac{1}{\sqrt{x}}\right)^{2}$ $\sqrt{\frac{1}{x}+2}=\frac{1}{x}$ $\frac{1}{\sqrt{x}}=\frac{1}{x}-2$ $\left(\frac{1}{\sqrt{x}}\right)^{2}=\left(\frac{1}{x}-2\right)^{2}$ $\frac{1}{x}=\frac{1}{x^{2}}-\frac{4}{x}+4$ $\frac{1}{x^{2}}-\frac{5}{x}+4=0$ $4x^{2}-5x+1=0$ $(4x-1)(x-1)=0$ $x=\frac{1}{4}$ or $x\neq 1$ **OR/*OF***	 ✓ squaring both sides ✓ isolation of surd ✓ squaring both sides only after isolation of surd ✓ standard form ✓ answer with selection (5) **OR/*OF***

1.1.5	$\sqrt{\sqrt{\frac{1}{x}+2}}=\frac{1}{\sqrt{x}}$ Let $\frac{1}{\sqrt{x}}=k$ $\sqrt{k+2}=k$ $k+2=k^2$ $k^2-k-2=0$ $(k-2)(k+1)=0$ $\therefore k=2 \quad \text{or} \quad k=-1$ $\frac{1}{\sqrt{x}}=2 \qquad \text{or} \qquad \frac{1}{\sqrt{x}}\neq -1$ $2\sqrt{x}=1$ $4x=1$ $\therefore x=\frac{1}{4}$	✓ equation ✓ squaring both sides ✓ standard form ✓ substitution ✓ answer with selection (5)
1.2	$x=y+2 \quad \ldots..(1)$ $5xy=x^2+6 \quad \ldots..(2)$ $5(y+2)y=(y+2)^2+6$ $5y^2+10y=y^2+4y+4+6$ $4y^2+6y-10=0$ $2y^2+3y-5=0$ $(2y+5)(y-1)=0$ $y=-\frac{5}{2} \text{ or } y=1$ $x=-\frac{1}{2} \text{ or } x=3$ **OR/*OF*** $y=x-2 \quad \ldots..(1)$ $5xy-6=x^2 \quad \ldots..(2)$ $5x(x-2)-6=x^2$ $5x^2-10x-6=x^2$ $4x^2-10x-6=0$ $2x^2-5x-3=0$ $(2x+1)(x-3)=0$ $x=-\frac{1}{2} \text{ or } x=3$ $y=-\frac{5}{2} \text{ or } y=1$	✓ $x=y+2$ ✓ $5xy=x^2+6$ ✓ substitution ✓ standard form ✓*y*-values ✓ *x*-values (6) **OR/*OF*** ✓ $y=x-2$ ✓ $5xy-6=x^2$ ✓ substitution ✓ standard form ✓*x*-values ✓ *y*-values (6) **[25]**

QUESTION/*VRAAG* 2

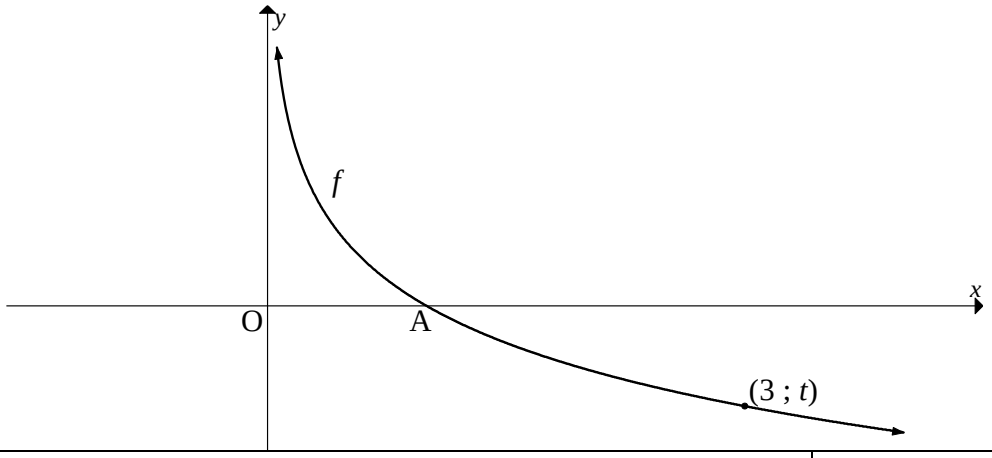
2.1.1	$(10+t)+(t-2)+(t+4)$ $\frac{t-2}{t+10}=\frac{t+4}{t-2}$ $(t-2)^2=(t+4)(t+10)$ $t^2-4t+4=t^2+14t+40$ $-18t=36$ $\therefore t=-2$	✓ equating the ratios ✓ cross multiplication ✓ expansion (3)
2.1.2	$8;-4;\ldots$ $r=\frac{-4}{8}=-\frac{1}{2}$ $T_{25}=8\left(-\frac{1}{2}\right)^{24}$ $T_{25}=\left(\frac{1}{2}\right)^{21}$ or $T_{25}=(2)^{-21}$ or $T_{25}=(8)^{-7}$ or $T_{25}=(128)^{-3}$ or $T_{25}=(2\ 097\ 152)^{-1}$	✓8 and -4 ✓r ✓ answer in exponential form (3)
2.1.3	$S_\infty=\frac{a}{1-r}$ $S_\infty=\frac{8}{1-\left(-\frac{1}{2}\right)}$ $S_\infty=\frac{16}{3}=5,33$	✓substitution ✓ answer (2)
2.2.1	$T_{14}-T_6$ $=4\times 8$ $=32$ **OR/*OF*** $T_{14}-T_6$ $=(4(14)-1)-(4(6)-1)$ $=55-23$ $=32$ **OR/*OF*** $T_{14}-T_6$ $=(4(k+13)-1)-(4(k+5)-1)$ $=4k+51-(4k+19)$ $=32$	✓✓answer (2) **OR/*OF*** ✓ subs ✓ answer (2) **OR/*OF*** ✓ subs ✓ answer (2)

2.2.2	$n = 118 - k$ $T_{117} = 467$ $S_{118-k} = \frac{118-k}{2}\left[4k - 1 + 467\right]$ $26\ 675 = (118-k)\left[2k + 233\right]$ $26\ 675 = 236k + 27494 - 2k^2 - 233k$ $2k^2 - 3k - 819 = 0$ $(k - 21)(2k + 39) = 0$ $\therefore k = 21$ or $k \neq -\frac{39}{2}$ **OR/*OF*** $n = 118 - k$ $S_{118-k} = \frac{118-k}{2}\left[2(4k-1) + (118-k-1)(4)\right]$ $26\ 675 = \frac{118-k}{2}\left[8k - 2 + 468 - 4k\right]$ $53\ 350 = (118-k)\left[4k + 466\right]$ $53\ 350 = 472k + 54\,988 - 4k^2 - 466k$ $4k^2 - 6k - 1638 = 0$ $2k^2 - 3k - 819 = 0$ $(k - 21)(2k + 39) = 0$ $\therefore k = 21$ or $k \neq -\frac{39}{2}$ **OR/OF** $T_1 = 3 \quad T_2 = 7$ $S_{117} - S_{k-1} = 26\ 675$ $S_{117} = \frac{n}{2}\left[2a + (n-1)d\right]$ $= \frac{117}{2}\left[2(3) + (116)4\right]$ $= 27\ 495$ $\therefore S_{k-1} = 27\ 495 - 26\ 675 = 820$ $820 = \frac{n}{2}\left[2(3) + 4n - 4\right]$ $0 = 2n^2 + n - 820$ $(2n + 41)(n - 20) = 0$ $\therefore n = 20$ $\therefore k - 1 = 20$ $k = 21$	✓ number of terms ✓ last term ✓ substitution ✓standard form ✓answer with selection (5) **OR/*OF*** ✓ number of terms ✓ substitution ✓simplification ✓ standard form ✓answer with selection (5) ✓ 27 495 ✓ difference ✓substitution ✓ standard form ✓answer with selection (5)
		[15]

QUESTION/*VRAAG* 3

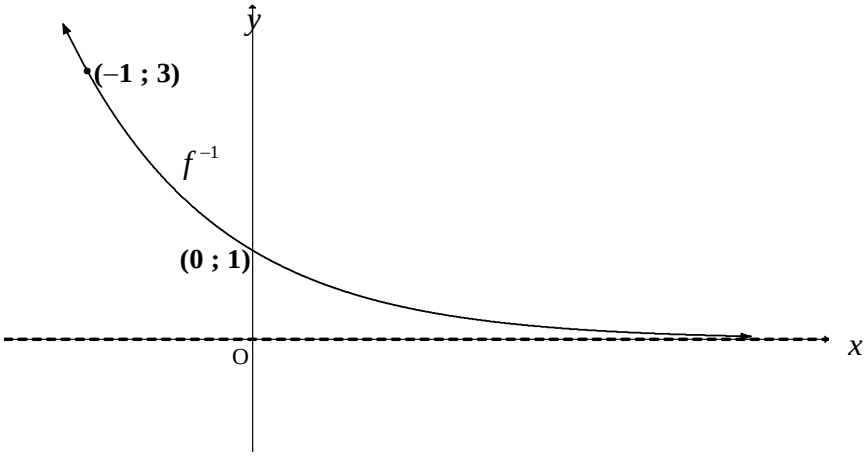
3.1	$36 \;;\; 71 \;;\; 104 \;;\; 135 \;;\; 164$ $35 \quad 33 \quad 31 \quad 29$ -2 $T_5 = 164$	✓first differences ✓ answer (2)
3.2	$2a = -2$ $a = -1$ $3(-1) + b = 35$ $b = 38$ $-1 + 38 + c = 36$ $c = -1$ $T_n = -n^2 + 38n - 1$	✓ $2a = -2$ ✓ $3(-1) + b = 35$ ✓ $-1 + 38 + c = 36$ (3)
3.3	$n = \dfrac{-38}{2(-1)} = 19$ $T_{19} = -(19)^2 + 38(19) - 1 = 360$ **OR/*OF*** $T'_n = -2n + 38 = 0$ $\therefore n = 19$ $T_{19} = -(19)^2 + 38(19) - 1 = 360$	✓ method ✓ n ✓ answer (3) **OR/*OF*** ✓ method ✓ n ✓ answer (3)
3.4	$\dfrac{n+3}{2} = 19$ $n + 3 = 38$ $n = 35$ **OR/*OF*** $-n^2 + 38n - 1 = 104$ $n^2 - 38n + 105 = 0$ $(n - 35)(n - 3) = 0$ $n = 35$	✓ method ✓ answer (2) ✓ method ✓ answer (2)
		[10]

QUESTION/*VRAAG* 4



4.1	$t = \log_{\frac{1}{3}} 3$ $t = -1$	✓ answer (1)
4.2	$A(1;0)$	✓ answer (1)
4.3	$f(x) = \log_{\frac{1}{3}} x$ $y = \log_{\frac{1}{3}} x$ $x = \log_{\frac{1}{3}} y$ $y = \left(\frac{1}{3}\right)^x = 3^{-x}$	✓ swopping ✓ answer (2)
4.4	$y = 0$	✓ answer (1)

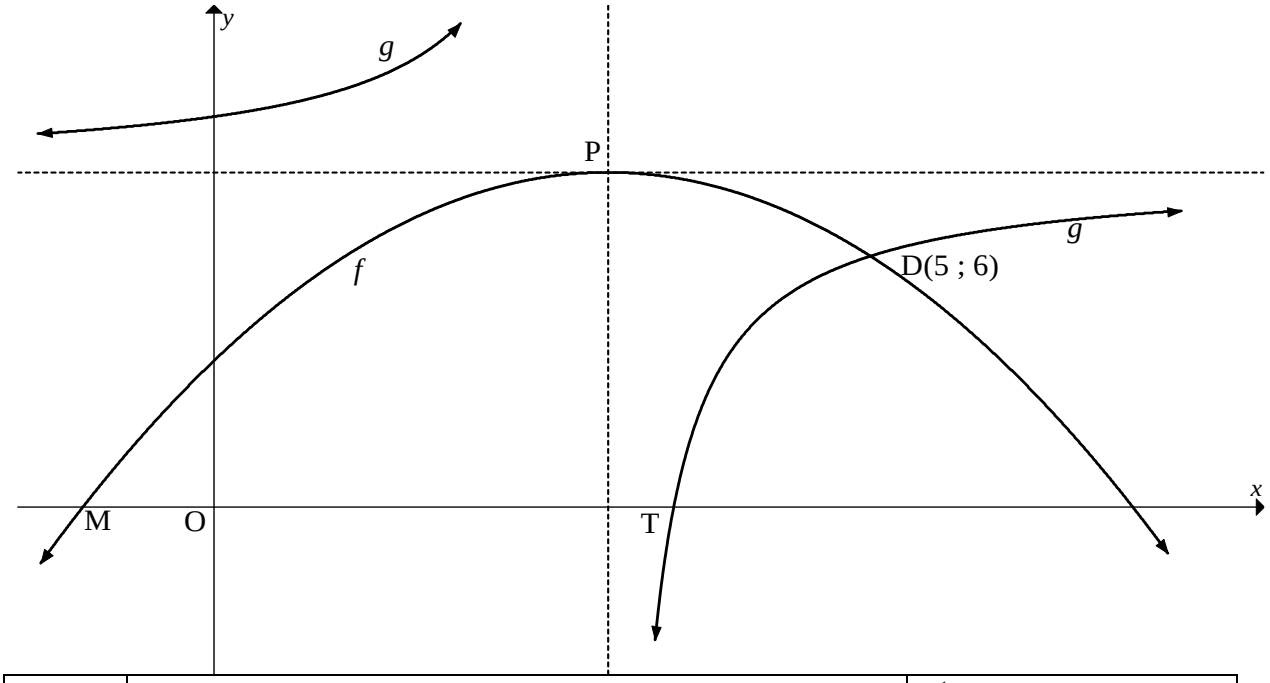
4.5



✓ decreasing exponential shape with asymptote $y = 0$
✓ y-intercept (0 ; 1)
✓ any point

4.6	(4 ; 3) is a point on h $0 < y < 3$ or $y \in (0 ; 3)$	✓✓ answer (2)
		[10]

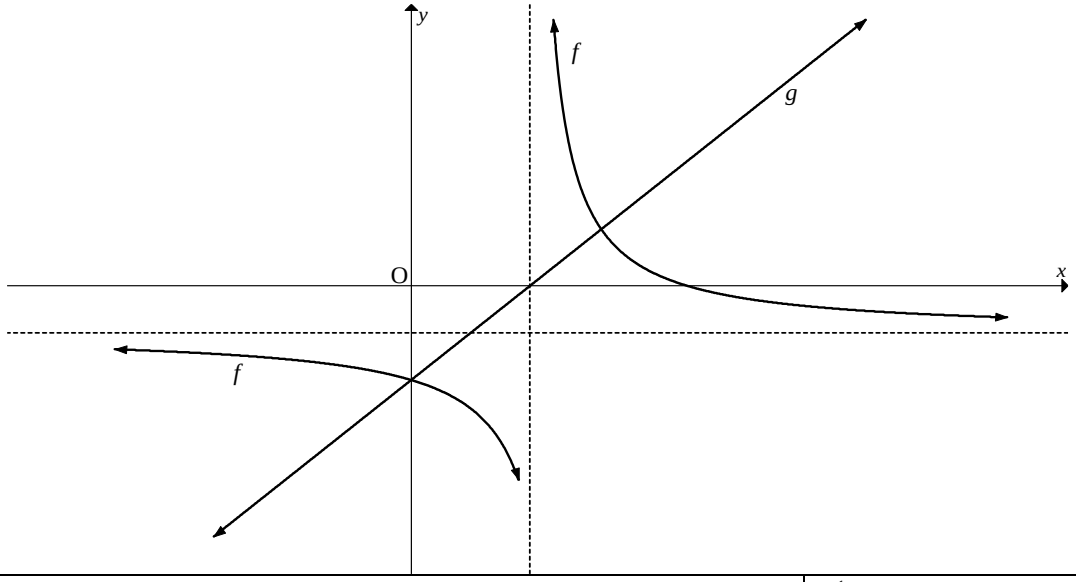
QUESTION/*VRAAG* 5



5.1	$x \in R,\ x \neq 3$	✓ answer (1)
5.2	$y \leq 8$	✓ answer (1)
5.3.1	$3 < x \leq 5$ **OR/*OF*** $x \in (3;5]$	✓✓ answer (2)
5.3.2	$x < 1$ or $x > 5$ **OR/*OF*** $x \in (-\infty;1)$ or $x \in (5;\infty)$	✓ $x < 1$ ✓ $x > 5$ (2)
5.4	$y = a(x-3)^2 + 8$ $6 = a(5-3)^2 + 8$ $-2 = 4a$ $\therefore a = -\frac{1}{2}$ $y = -\frac{1}{2}(x-3)^2 + 8$ $y = -\frac{1}{2}(x^2 - 6x + 9) + 8$ $y = -\frac{1}{2}x^2 + 3x + \frac{7}{2}$	✓ p and q values ✓ substitution (5 ; 6) ✓ simplification (3)

5.5	$y=-\frac{1}{2}x^2+3x+\frac{7}{2}$ $x^2-6x-7=0$ $(x-7)(x+1)=0$ $x=7 \quad \text{or} \quad x=-1$ M$(-1\,;0)$ $0=\frac{-4}{x-3}+8$ $-8x+24=-4$ $x=\frac{7}{2}$ $\text{T}\left(\frac{7}{2};0\right)$ $\text{MT}=\frac{7}{2}+1=\frac{9}{2}=4,5$	✓ solve for x ✓ x-values ✓ coordinates of M ✓ solve for x ✓ x-value ✓ MT (6)
5.6	$f(x)=-\frac{1}{2}x^2+3x+\frac{7}{2}$ $f'(x)=-x+3$ $m=f'(5)$ $=-5+3$ $=-2$ $6=-2(5)+c$ $c=16$ $\therefore y=-2x+16$	✓ $f'(x)=-x+3$ ✓ $m=f'(5)$ ✓ answer (3)
		[18]

QUESTION/*VRAAG* 6



6.1	$(-p\ ;\ 0)$	✓ $(-p\ ;\ 0)$ (1)
6.2	$g(x) = x + c$ $q = 1 + c$ $f(x) = \frac{a}{x+c} + 1 + c$	✓ $q = 1 + c$ ✓ $f(x) = \frac{a}{x+c} + 1 + c$
	Point $(0\ ;\ c)$ $c = \frac{a}{0+c} + 1 + c$ $-1 = \frac{a}{c}$ $a = -c$	
	Point $(3\ ;\ 3 + c)$ $3 + c = \frac{a}{3+c} + 1 + c$	✓ $3 + c = \frac{a}{3+c} + 1 + c$
	$3 + c = \frac{-c}{3+c} + 1 + c$ $9 + 6c + c^2 = -c + 3 + 4c + c^2$ $3c = -6$ $c = -2$ $a = 2$ $q = -1$ $f(x) = \frac{2}{x-2} - 1$	✓ $a = 2$ ✓ $q = -1$ (5)
	OR/*OF*	**OR/*OF***

	$0 = x + c$ $\therefore \quad x = -c$ $q = 1 + c$ $f(x) = \frac{a}{x+c} + 1 + c$ $3 + c = \frac{a}{3+c} + 1 + c$ $2 = \frac{a}{3+c}$ $a = 6 + 2c$ $y = \frac{6+2c}{x+c} + 1 + c$ $c = \frac{6+2c}{0+c} + 1 + c$ $-1 = \frac{6+2c}{c}$ $-c = 6 + 2c$ $\therefore \quad c = -2$ $a = 2$ $q = -1$ $\therefore \quad f(x) = \frac{2}{x-2} - 1$	✓ $q = 1 + c$ ✓ $f(x) = \frac{a}{x+c} + 1 + c$ ✓ $3 + c = \frac{a}{3+c} + 1 + c$ ✓ $a = 2$ ✓ $q = -1$ (5)
6.3	Translation of 1 unit down **OR/*OF*** Translation of 1 unit to the right	✓✓ answer (2) **OR/*OF*** ✓✓ answer (2)
		[8]

QUESTION/*VRAAG* 7

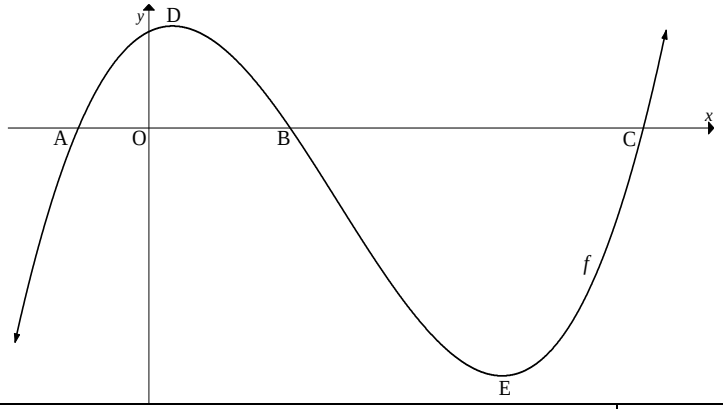
7.1	$A = P(1+i)^n$ $A = 40\,000(1+7{,}8\%)^5$ $A = R58\,230{,}94$	✓ substitution into correct formula ✓ answer (2)
7.2	$F = \dfrac{x\left[(1+i)^n - 1\right]}{i}$ $F = \dfrac{2\,300\left[\left(1+\dfrac{0{,}058}{4}\right)^{24} - 1\right]}{\dfrac{0{,}058}{4}} \times \left(1+\dfrac{0{,}058}{4}\right)$ $F = R66\ 411{,}60$ **OR/*OF*** $F = \dfrac{2\,300\left[\left(1+\dfrac{0{,}058}{4}\right)^{25} - 1\right]}{\dfrac{0{,}058}{4}} - 2300$ $F = R66\,411{,}60$	✓ i ✓ substitution into correct formula ✓ future value $\times(1+i)^1$ ✓ answer (4) **OR/*OF*** ✓ i ✓ substitution into correct formula ✓ -2300 ✓ answer (4)
7.3.1	$A = P(1+i)^n$ $A = 900\,000\left(1+\dfrac{0{,}068}{12}\right)^3$ $= R915\,386{,}86$ $P = \dfrac{x\left[1-(1+i)^{-n}\right]}{i}$ $915\,386{,}86 = \dfrac{10\,000\left[1-\left(1+\dfrac{0{,}068}{12}\right)^{-n}\right]}{\dfrac{0{,}068}{12}}$ $\left(1+\dfrac{0{,}068}{12}\right)^{-n} = 0{,}4812...$ $-n = \log_{1{,}005...} 0{,}4812...$ $n = 129{,}419...$ months $\therefore 132{,}419$ months since loan was granted $\therefore 133$ months since loan was granted	✓answer ✓ substitution into correct formula ✓ correct use of logs ✓ answer of n ✓ final answer (5)

7.3.2	$P = \dfrac{10\,000\left[1-\left(1+\dfrac{0,068}{12}\right)^{-0,419\ldots}\right]}{\dfrac{0,068}{12}}$ $= \text{R}4\,173,55\ldots$ Final payment = $4173,55\ldots\left(1+\dfrac{0,068}{12}\right)^{1} = R4\,197,21$ **OR/*OF*** $\text{A} = 915\,386,86\left(1+\dfrac{0,068}{12}\right)^{129}$ $= \text{R}1\,897\,482,712$ $\text{F} = \dfrac{10\,000\left[\left(1+\dfrac{0,068}{12}\right)^{129}-1\right]}{\dfrac{0,068}{12}}$ $= \text{R}1\,893\,309,16$ Balance after 129 months = R4 173,552 Final payment = $4\,173,552\left(1+\dfrac{0,068}{12}\right)^{1} = \text{R}4\,197,21$	✓ substitution ✓ *n* ✓ balance ✓ final payment (4) **OR/*OF*** ✓answer ✓ answer ✓balance ✓final payment (4)
		[15]

QUESTION/*VRAAG* 8

8.1	$f(x)=-2x+3$ $f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$ $=\lim\limits_{h\to 0}\dfrac{-2(x+h)+3-(-2x+3)}{h}$ $=\lim\limits_{h\to 0}\dfrac{-2h}{h}$ $=\lim\limits_{h\to 0}(-2)$ $=-2$ **OR/*OF*** $f(x)=-2x+3$ $f(x+h)=-2(x+h)+3$ $f(x+h)-f(x)=-2x-2h+3+2x-3=-2h$ $f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$ $=\lim\limits_{h\to 0}\dfrac{-2h}{h}$ $=\lim\limits_{h\to 0}(-2)$ $=-2$	✓ $f(x+h)$ ✓substitution ✓simplification ✓answer (4) **OR/*OF*** ✓ $f(x+h)$ ✓simplification ✓substitution ✓answer (4)
8.2.1	$g(x)=-3x^4+2x$ $g'(x)=-12x^3+2$	✓ $-12x^3$ ✓ 2 (2)
8.2.2	$y=\dfrac{2x^4+1}{x^2}$ $y=2x^2+x^{-2}$ $\dfrac{dy}{dx}=4x-2x^{-3}$	✓ $2x^2$ ✓ x^{-2} ✓ derivative first term ✓ derivative second term (4)
		[10]

QUESTION/*VRAAG* 9



9.1	$f(x)=x^3-8x^2+5x+14$ $f'(x)=3x^2-16x+5=0$ $(3x-1)(x-5)=0$ $x=\frac{1}{3}$ or $x=5$ E(5 ; – 36)	✓ $f'(x)$ ✓ $f'(x)=0$ ✓ *x*-value ✓ *y*-value (4)
9.2	$f''(x)=6x-16<0$ $x<\frac{8}{3}$ **OR/*OF*** $x=\frac{\frac{1}{3}+5}{2}=\frac{8}{3}$ $x<\frac{8}{3}$	✓ $f''(x)$ ✓ $f''(x)<0$ ✓ answer (3) **OR/*OF*** ✓ midpoint of TPs ✓ $f''(x)<0$ ✓ answer (3)
9.3	*x*-intercepts of *f*: (– 1 ; 0) and (7 ; 0) $-1<x<2$ or $\frac{8}{3}<x<7$	✓✓ *x*-intercepts ✓ first interval ✓ second interval (4)
9.4	$3x^2-16x+5=-11$ $3x^2-16x+16=0$ $(x-4)(3x-4)=0$ $x=4$ or $x=\frac{4}{3}$ At $x=4$: $(4)^3-8(4)^2+5(4)+14=-11(4)+t$ $t=14$ At $x=\frac{4}{3}$: $\left(\frac{4}{3}\right)^3-8\left(\frac{4}{3}\right)^2+5\left(\frac{4}{3}\right)+14=-11\left(\frac{4}{3}\right)+t$ $t=\frac{634}{27}=23\frac{13}{27}=23,48$	✓ equating ✓ *x*-values ✓ answer ✓ answer

$\therefore 14 < t < \frac{634}{27}$ ✓✓ answer (6)

OR/*OF*

$x^3 - 8x^2 + 5x + 14 = -11x + t$
$x^3 - 8x^2 + 5x + 14 + 11x = t$
$x^3 - 8x^2 + 16x + 14 = t$

OR/*OF*
✓ equating

$3x^2 - 16x + 16 = 0$
$(x - 4)(3x - 4) = 0$
$x = 4 \quad \text{or} \quad x = \frac{4}{3}$ ✓ *x*-values

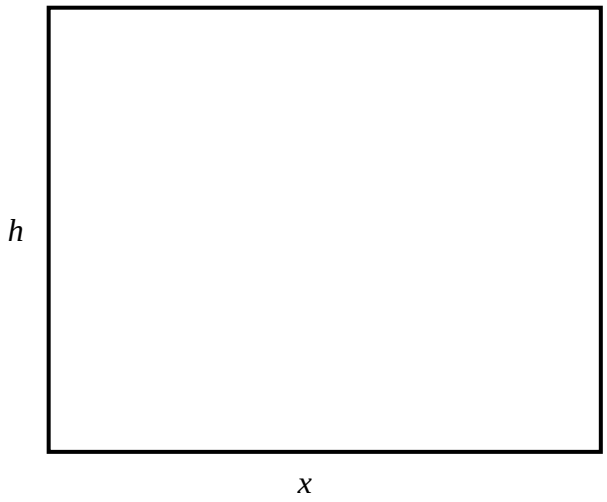
At $x = 4$: $(4)^3 - 8(4)^2 + 5(4) + 14 = -11(4) + t$
$t = 14$ ✓ answer

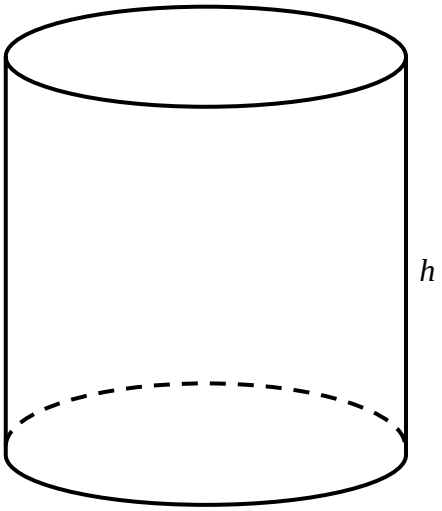
At $x = \frac{4}{3}$: $\left(\frac{4}{3}\right)^3 - 8\left(\frac{4}{3}\right)^2 + 5\left(\frac{4}{3}\right) + 14 = -11\left(\frac{4}{3}\right) + t$
$t = \frac{634}{27} = 23\frac{13}{27} = 23,48$ ✓ answer

$\therefore 14 < t < \frac{634}{27}$ ✓✓ answer (6)

[17]

QUESTION/*VRAAG* 10



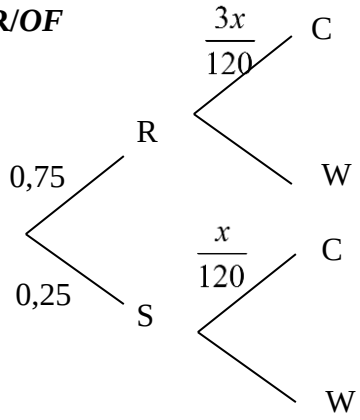
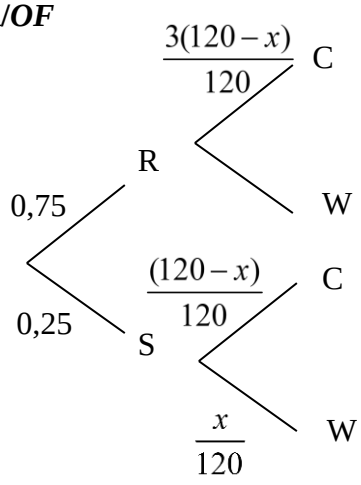


10.1	$2x+2h=50$ $h=25-x$ $2\pi r=x$ $r=\dfrac{x}{2\pi}$ $\text{V}=\pi r^2 h$ $\text{V}=\pi\left(\dfrac{x}{2\pi}\right)^2(25-x)$ $\text{V}=\dfrac{\pi x^2}{4\pi^2}(25-x)$ $\text{V}=\dfrac{25x^2}{4\pi}-\dfrac{x^3}{4\pi}$	✓ $2x+2h=50$ ✓ $r=\dfrac{x}{2\pi}$ ✓ substitution (3)
10.2	$\text{V}'(x)=\dfrac{50x}{4\pi}-\dfrac{3x^2}{4\pi}$ $\text{V}'(x)=\dfrac{50x}{4\pi}-\dfrac{3x^2}{4\pi}=0$ $50x-3x^2=0$ $0=x(50-3x)$ $x\neq 0 \quad \text{or} \quad x=\dfrac{50}{3}$ $\therefore x=\dfrac{50}{3}=16,67$	✓ $\dfrac{50x}{4\pi}-\dfrac{3x^2}{4\pi}$ ✓ $\text{V}'(x)=0$ ✓ answer with selection (3)
		[6]

QUESTION/*VRAAG* 11

	JUICE	**ENERGY DRINKS**	**TOTAL**
Females	*a*	**72**	**120**
Males	36	54	**90**
Total	**84**	**126**	210

11.1.1	$\text{P}(\text{Male and Prefer juice}) = \text{P}(\text{Male}) \times \text{P}(\text{Prefer juice})$ $\frac{36}{210} = \frac{90}{210} \times \frac{e}{210}$ $e = 84$	✓ $\text{P}(\text{M and J}) = \text{P}(\text{M}) \times \text{P}(\text{J})$ ✓ $\frac{36}{210}$ ✓ P (Male) $= \frac{90}{210}$ (3)
11.1.2	$\text{P}(\text{Female and like energy drink}) = \frac{b}{210}$ $d = 210 - 84 = 126$ $b = 126 - 54 = 72$ $\text{P}(\text{Female and like energy drink}) = \frac{72}{210} = \frac{12}{35} = 0,34$ **OR/*OF*** $c = 120$ $b = 72$ $\text{P}(\text{Female and like energy drink}) = \frac{72}{210} = \frac{12}{35} = 0,34$	✓ *d*- value ✓ *b*-value ✓ answer (3) **OR/*OF*** ✓ *c*- value ✓ *b*-value ✓ answer (3)

11.2	$\frac{3}{4}(3x)+\frac{1}{4}x=\frac{7}{12}$ $27x+3x=7$ $30x=7$ $x=\frac{7}{30}$ $\therefore$ 28 cups	✓ $\frac{3}{4}(3x)$ ✓ $\frac{1}{4}x$ ✓ $=\frac{7}{12}$ ✓answer (4)
	OR/*OF*  	**OR/*OF***
	$\frac{75}{100}\times\left(\frac{3x}{120}\right)+\frac{25}{100}\left(\frac{x}{120}\right)=\frac{7}{12}$ $\frac{3}{160}x+\frac{1}{480}x=\frac{7}{12}$ $10x=280$ $x=28$ cups of coffee	✓ $\frac{75}{100}\times\left(\frac{3x}{120}\right)$ ✓ $\frac{25}{100}\left(\frac{x}{120}\right)$ ✓ $=\frac{7}{12}$ ✓answer (4)
	OR/*OF*  	**OR/*OF***
	$\frac{75}{100}\times\left(\frac{3(120-x)}{120}\right)+\frac{25}{100}\left(\frac{120-x}{120}\right)=\frac{7}{12}$ $270-\frac{9}{4}x+30-\frac{1}{4}x=70$ $-\frac{5}{2}x=-230$ $\therefore x=92$ (bottles of water) $\therefore$ there are 28 cups of coffee	✓ $\frac{75}{100}\times\left(\frac{3(120-x)}{120}\right)$ ✓ $\frac{25}{100}\left(\frac{120-x}{120}\right)$ ✓ $=\frac{7}{12}$ ✓answer (4)

11.3.1	$7.6! = 5\,040$ **OR/*OF*** $7! = 5\,040$	✓✓ answer (2) **OR/*OF*** ✓✓ answer (2)
11.3.2	Possible outcomes: A × 6 × 5 × B × 4 × 3 × 2 × 1 A × 6 × 5 × 4 × B × 3 × 2 × 1 A × 6 × 5× 4 × 3 × B × 2 × 1 A × 6 × 5 × 4 × 3 × 2 × B × 1 A × 6 × 5 × 4 × 3 × 2 × 1 × B $5\times6! + 4\times6! + 3\times6! + 2\times6! + 1\times6!$ $= 6!(5+4+3+2+1)$ $= 6!(15)$ P(two or more runners finishing after Andrew) = $\frac{6!(15)}{8!}$ $= \frac{15}{56}$ $= 0,27$ **OR/*OF*** $\frac{8!-(7!.2+2.6.6!)}{8!.2}$ $= \frac{15}{56}$	✓✓ 6! (15) ✓ 8! in denominator ✓ $\frac{6!(15)}{8!}$ or $\frac{15}{56}$ (4) **OR/*OF*** ✓ 8! in numerator and denominator ✓✓ $(7!.2+2.6.6!)$ ✓ $\frac{15}{56}$ (4)
		[16]

TOTAL/*TOTAAL*: 150