basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NASIONALE SENIOR SERTIFIKAAT

GRAAD 12

WISKUNDE V1

NOVEMBER 2019

PUNTE: 150

TYD: 3 uur

Hierdie vraestel bestaan uit 9 bladsye en 1 inligtingsblad.

INSTRUKSIES EN INLIGTING

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

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

VRAAG 1

1.1 Los op vir x:

1.1.1 $x^2 + 5x - 6 = 0$ (3)

1.1.2 $4x^2 + 3x - 5 = 0$ (korrek tot TWEE desimale plekke) (3)

1.1.3 $4x^2 - 1 < 0$ (3)

1.1.4 $\left(\sqrt{\sqrt{32} + x}\right)\left(\sqrt{\sqrt{32} - x}\right) = x$ (4)

1.2 Los gelyktydig op vir x en y:
$y + x = 12$ en $xy = 14 - 3x$ (5)

1.3 Beskou die produk $1 \times 2 \times 3 \times 4 \times \ldots \times 30$.
Bepaal die grootste waarde van k sodat 3^k 'n faktor van die produk is. (4)
[22]

VRAAG 2

2.1 Gegee die kwadratiese ry: 321 ; 290 ; 261 ; 234 ; ....

2.1.1 Skryf die waardes van die volgende TWEE terme van die ry neer. (2)

2.1.2 Bepaal die algemene term van die ry in die vorm $T_n = an^2 + bn + c$. (4)

2.1.3 Watter term(e) van die ry sal 'n waarde van 74 hê? (4)

2.1.4 Watter term in die ry het die kleinste waarde? (2)

2.2 Gegee die meetkundige reeks: $\frac{5}{8} + \frac{5}{16} + \frac{5}{32} + \ldots = \mathrm{K}$

2.2.1 Bepaal die waarde van K indien die reeks 21 terme het. (3)

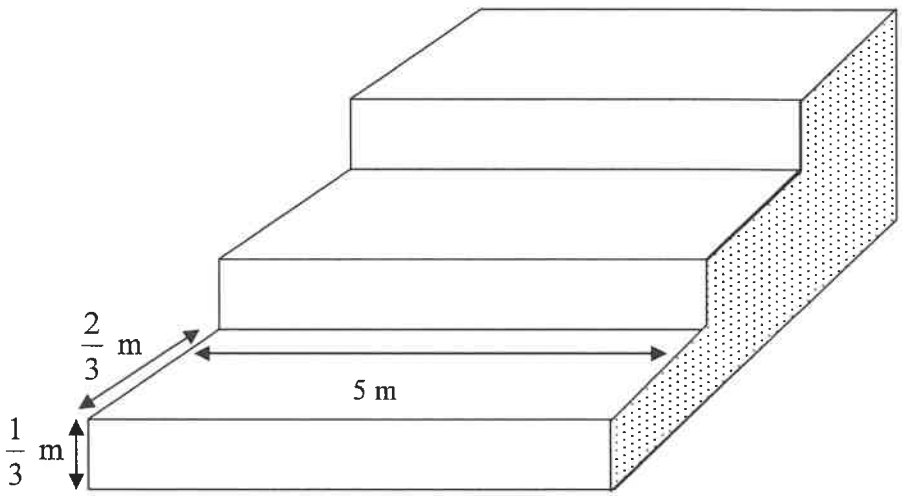
2.2.2 Bepaal die grootste waarde van n waarvoor $T_n > \frac{5}{8192}$ (4)
[19]

VRAAG 3

3.1 Bepaal, sonder die gebruik van 'n sakrekenaar, die waarde van: $\sum_{y=3}^{10} \frac{1}{y-2} - \sum_{y=3}^{10} \frac{1}{y-1}$ (3)

3.2 'n Staalpaviljoen by 'n sportterrein bestaan uit 'n reeks van 12 trappe, waarvan die eerste 3 in die diagram hieronder getoon word.

Elke trap is 5 m wyd. Elke trap het 'n hoogte van $\frac{1}{3}$ m en 'n loopvlak van $\frac{2}{3}$ m, soos in diagram hieronder getoon.



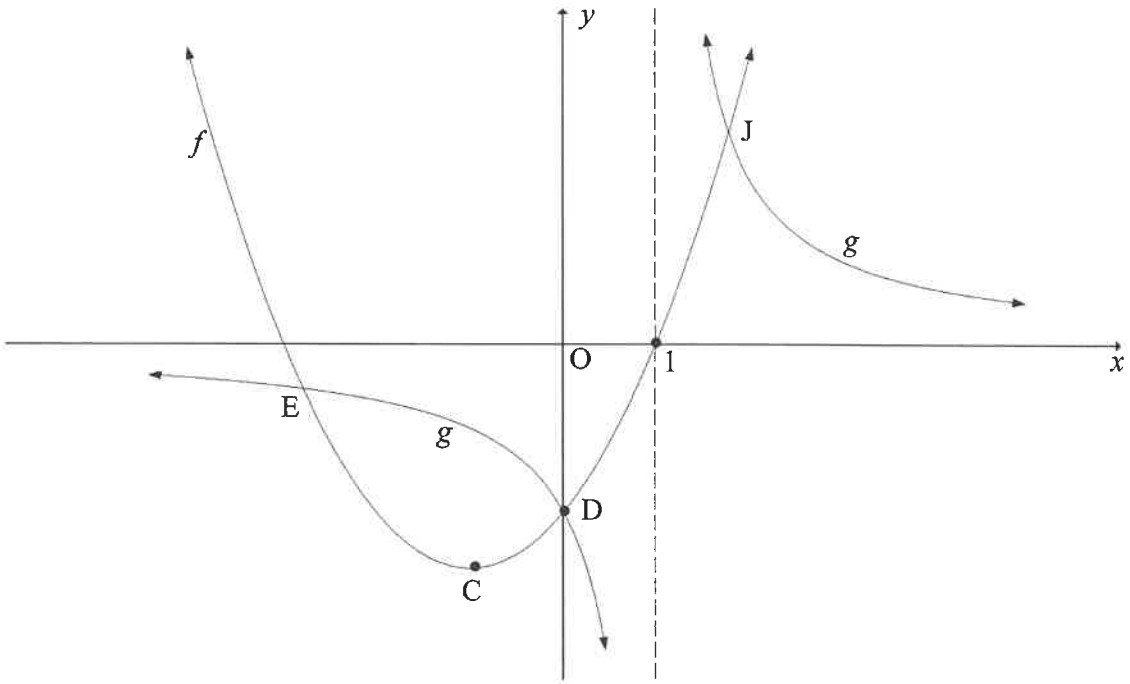
Die oop kant (geskakeer op die skets) aan elke kant van die paviljoen moet met metaalplate bedek word. Bereken die oppervlakte (in m^2) van metaalplate wat benodig word om beide oop kante te bedek. (6)

[9]

VRAAG 4

Hieronder is die grafieke van $f(x) = x^2 + bx - 3$ en $g(x) = \dfrac{a}{x+p}$.

- f het 'n draaipunt by C en sny die x-as by $(1\ ;\ 0)$.
- D is die y-afsnit van beide f en g. Die grafieke f en g sny mekaar ook by E en J.
- Die vertikale asimptoot van g gaan deur die x-afsnit van f.



4.1 Skryf die waarde van p neer. (1)

4.2 Toon aan dat $a = 3$ en $b = 2$. (3)

4.3 Bereken die koördinate van C. (4)

4.4 Gee die waardeversameling van f. (2)

4.5 Bepaal die vergelyking van die lyn deur C wat 'n hoek van $45°$ met die positiewe x-as vorm. Gee jou antwoord in die vorm $y = \ldots$ (3)

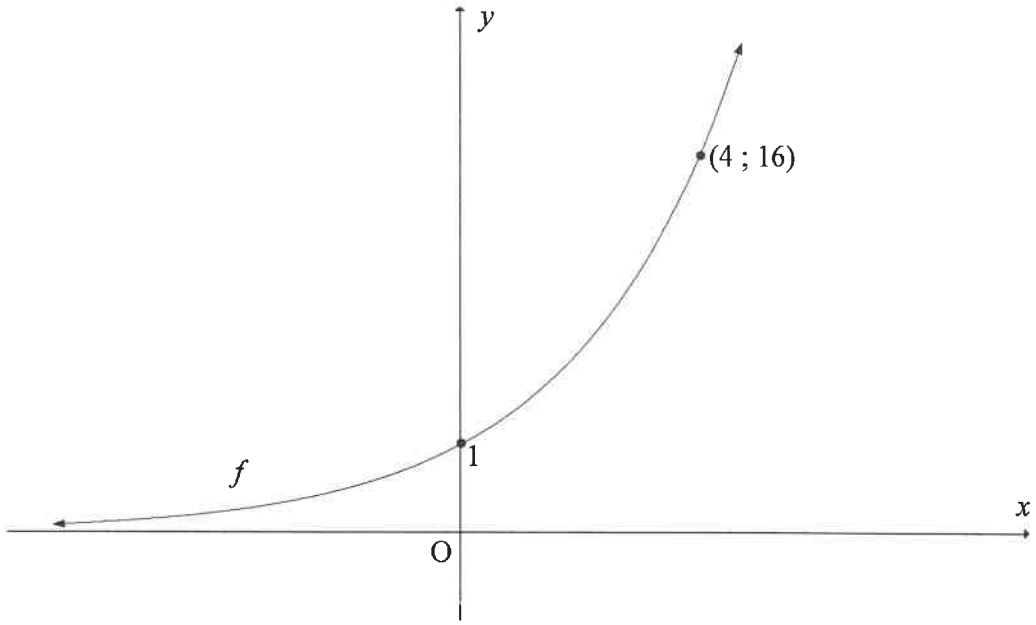
4.6 Is die reguit lyn, wat in VRAAG 4.5 bepaal is, 'n raaklyn aan f? Verduidelik jou antwoord. (2)

4.7 Die funksie $h(x) = f(m - x) + q$ het slegs een x-afsnit by $x = 0$. Bepaal die waardes van m en q. (4)

[19]

VRAAG 5

Hieronder is die grafiek van $f(x) = k^x$; $k > 0$. Die punt (4 ; 16) lê op f.



5.1 Bepaal die waarde van k. (2)

5.2 Grafiek g word verkry deur die grafiek f om die lyn $y = x$ te reflekteer. Bepaal die vergelyking van g in die vorm $y = \ldots$ (2)

5.3 Skets die grafiek g. Dui op jou grafiek die koördinate van twee punte op g aan. (4)

5.4 Gebruik jou grafiek om die waarde(s) van x te bepaal waarvoor:

5.4.1 $f(x) \times g(x) > 0$ (2)

5.4.2 $g(x) \leq -1$ (2)

5.5 Indien $h(x) = f(-x)$, bereken die waarde van x waarvoor $f(x) - h(x) = \frac{15}{4}$ (4)

[16]

VRAAG 6

6.1 Twee vriende, Kuda en Thabo, wil elkeen R5 000 vir vier jaar lank belê. Kuda belê sy geld in 'n rekening wat enkelvoudige rente teen 8,3% p.j. betaal. Aan die einde van die vier jaar sal hy 'n bonus van presies 4% van die finale opgelope bedrag ontvang. Thabo belê sy geld in 'n rekening wat rente teen 8,1% p.j., maandeliks saamgestel, betaal.

Wie se belegging sal die beste opbrengs aan die einde van die vier jaar lewer? Regverdig jou antwoord met toepaslike berekeninge. (5)

6.2 'n Bank het nege jaar gelede 'n huislening van R525 000 aan Mandy toegestaan. Hierdie lening moes oor 20 jaar teen 'n rentekoers van 10% p.j., maandeliks saamgestel, terugbetaal word. Mandy se maandelikse paaiemente het presies een maand nadat die lening toegestaan is, begin.

6.2.1 Mandy het besluit om maandelikse paaiemente van R6 000, in plaas van die vasgestelde paaiement van R5 066,36 te betaal. Hoeveel paaiemente moet sy betaal om die lening te vereffen? (5)

6.2.2 Nadat sy vir nege jaar lank maandeliks R6 000 betaal het, het Mandy geld nodig gehad vir haar dogter se universiteitsgeld. Sy het die bank vir nog 'n lening gevra. Die bank het voorgestel dat sy eerder die geld wat sy elke maand ekstra betaal het as 'n belegging moes beskou en dat sy hierdie volle bedrag kan onttrek om haar dogter se studies te betaal. Bereken die maksimum bedrag wat Mandy uit die leningsrekening kan onttrek. (4)

[14]

VRAAG 7

7.1 Bepaal $f'(x)$ vanuit eerste beginsels indien dit gegee word dat $f(x) = 4 - 7x$. (4)

7.2 Bepaal $\frac{dy}{dx}$ indien $y = 4x^8 + \sqrt{x^3}$ (3)

7.3 Gegee: $y = ax^2 + a$

Bepaal:

7.3.1 $\frac{dy}{dx}$ (1)

7.3.2 $\frac{dy}{da}$ (2)

7.4 Die kurwe met vergelyking $y = x + \frac{12}{x}$ gaan deur die punt A(2 ; b). Bepaal die vergelyking van die lyn loodreg op die raaklyn aan die kurwe by A. (4)

[14]

VRAAG 8

Nadat 'n insek 'n kort afstand gevlieg het, kom dit teen 'n muur tot rus. Daarna het die insek begin om teen die muur te kruip. Die roete wat die insek gekruip het, kan deur $h(t) = (t-6)(-2t^2+3t-6)$ beskryf word, waar h die hoogte (in cm) bokant die vloer en t die tyd (in minute), vandat die insek begin kruip het, is.

8.1 Op watter hoogte bokant die vloer het die insek begin kruip? (1)

8.2 Hoeveel keer het die insek die vloer bereik? (3)

8.3 Bepaal die maksimum hoogte wat die insek bokant die vloer bereik het. (4)
[8]

VRAAG 9

Gegee: $f(x) = 3x^3$

9.1 Los op $f(x) = f'(x)$ (3)

9.2 Die grafieke f, f' en f'' gaan almal deur die punt $(0\ ;\ 0)$.

9.2.1 Vir watter van die grafieke sal $(0\ ;\ 0)$ 'n stasionêre punt wees? (1)

9.2.2 Verduidelik die verskil, indien enige, in die stasionêre punte waarna daar in VRAAG 9.2.1 verwys word. (2)

9.3 Bepaal die vertikale afstand tussen die grafieke van f' en f'' by $x = 1$. (3)

9.4 Vir watter waarde(s) van x is $f(x) - f'(x) < 0$? (4)
[13]

VRAAG 10

Die skoolbiblioteek is van Maandag tot Donderdag oop. Anna en Ben het albei een dag hierdie week in die skoolbiblioteek studeer. Indien die kans om enige dag van die week te studeer ewe waarskynlik is, bereken die waarskynlikheid dat Anna en Ben studeer het op:

10.1 Dieselfde dag (2)

10.2 Opeenvolgende dae (3)
[5]

VRAAG 11

11.1 Gebeurtenis **A** en **B** is onafhanklik, $P(A) = 0,4$ en $P(B) = 0,25$.

11.1.1 Stel die gegewe inligting op 'n Venn-diagram voor. Dui op die Venn-diagram die waarskynlikhede aan wat met elke area geassosieer word, aan. (3)

11.1.2 Bepaal P(**A** of NIE **B**). (2)

11.2 Motors Beperk vervaardig motors met 5 verskillende bakwerkstyle, 4 verskillende kleure vir die binnekant en 6 verskillende kleure vir die buitekant, soos in die tabel hieronder aangedui.

BAKWERKSTYLE	KLEURE VIR DIE BINNEKANT	KLEUR VIR DIE BUITEKANT
Vyf bakwerkstyle	Blou	Silwer
		Blou
	Grys	Wit
	Swart	Groen
		Rooi
	Rooi	Goud

Die kleur van die motor se binnekant moet NIE dieselfde as die kleur aan die buitekant wees NIE.

Motors Beperk wil een van elke moontlike variasie van hulle motor in hulle vertoonlokaal uitstal. Die vertoonlokaal het 'n vloerspasie van 500 m^2 en elke motor benodig 'n vloerspasie van $5\,m^2$.

Is hierdie uitstalling moontlik? Regverdig jou antwoord met behulp van die nodige berekeninge. (6)

[11]

TOTAAL: 150

INLIGTINGSBLAD

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

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

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

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

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

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

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

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

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

In ΔABC:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

$$\text{opp } \Delta\text{ABC} = \frac{1}{2}\text{ab.sinC}$$

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

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

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

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

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

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

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NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE 12/*GRAAD 12*

MATHEMATICS P1/*WISKUNDE V1*

NOVEMBER 2019

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

These marking guidelines consist of 18 pages.
Hierdie nasienriglyne bestaan uit* 18 *bladsye.

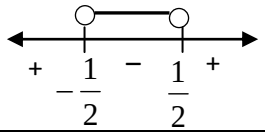
NOTE:

- 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, merk slegs die EERSTE poging.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die nasienriglyne van toepassing.*

QUESTION/*VRAAG* 1

1.1.1	$x^2+5x-6=0$ $(x+6)(x-1)=0$ $x=-6$ or $x=1$	✓factors ✓ $x=-6$ ✓ $x=1$ (3)
1.1.2	$4x^2+3x-5=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $x=\frac{-3\pm\sqrt{(3)^2-4(4)(-5)}}{2(4)}$ $x=\frac{-3\pm\sqrt{89}}{8}$ $x=-1{,}55$ or $x=0{,}8$	✓substitution into the correct formula ✓ $x=-1{,}55$ ✓ $x=0{,}8$ (3)
1.1.3	$4x^2-1<0$ $(2x+1)(2x-1)<0$ $\frac{-1}{2}<x<\frac{1}{2}$ 	✓factors ✓method ✓answer (3)
1.1.4	$\left(\sqrt{\sqrt{32}+x}\right)\left(\sqrt{\sqrt{32}-x}\right)=x$ $\sqrt{32-x^2}=x$ $32-x^2=x^2$ $-2x^2=-32$ $x^2=16$ $x=\pm4$ $\therefore x=4$	✓ $\sqrt{32-x^2}$ ✓ squaring both sides ✓ $x^2=16$ ✓ $x=4$ (selection) (4)

1.2	$y+x=12$ $y=-x+12$.....(1) $xy=14-3x$.....(2) Sub (1) into (2) $x(-x+12)=14-3x$ $-x^2+12x-14+3x=0$ $-x^2+15x-14=0$ $x^2-15x+14=0$ $(x-14)(x-1)=0$ $x=14$ or $x=1$ $y=-2$ or $y=11$ **OR/OF** $y+x=12$ $x=-y+12$.....(1) $xy=14-3x$.....(2) Sub (1) into (2) $y(-y+12)=14-3(-y+12)$ $12y-y^2-14+36-3y=0$ $-y^2+9y+22=0$ $y^2-9y-22=0$ $(y+2)(y-11)=0$ $y=-2$ or $y=11$ $x=14$ or $x=1$	✓*y* subject of the formula ✓ substitution ✓simplification ✓both values of *x* ✓both values of *y* (5) **OR/OF** ✓*x* subject of the formula ✓substitution ✓simplification ✓both values of *y* ✓both values of *x* (5)
1.3	3 6 9 12 15 18 21 24 27 30 3 3 3^2 3 3 3^2 3 3 3^3 3 $\therefore k=14$	✓identifying multiples of 3 ✓ten multiples of 3 ✓ powers of 3 ✓ answer (4)
		[22]

QUESTION/*VRAAG* 2

2.1.1	209 ; 186	✓209 ✓186 (2)
2.1.2	321 ; 290 ; 261 ; 234 1*st diff* -31 -29 -27 2*nd diff* 2 2 $2a = 2$ $3a + b = -31$ $a + b + c = 321$ $a = 1$ $3(1) + b = -31$ $1 + (-34) + c = 321$ $b = -34$ $c = 354$ $T_n = n^2 - 34n + 354$	✓ 2nd diff = 2 ✓ $a = 1$ ✓ $b = -34$ ✓ $c = 354$ (4)
2.1.3	$n^2 - 34n + 354 = 74$ $n^2 - 34n + 280 = 0$ $(n-14)(n-20) = 0$ $n = 14$ or $n = 20$	✓equating T_n to 74 ✓standard form ✓14 ✓ 20 (4)
2.1.4	$f'(n) = 0$ $2n - 34 = 0$ $2n = 34$ $n = 17$ Term 17 will have the smallest value **OR/OF** $n = \frac{-b}{2a}$ $n = \frac{34}{2}$ $n = 17$ Term 17 will have the smallest value **OR/OF** $n = \frac{14 + 20}{2} = 17$ Term 17 will have the smallest value	✓ $2n - 34 = 0$ ✓answer (2) **OR/OF** ✓substitution ✓answer (2) **OR/OF** ✓substitution ✓answer (2)

2.2.1	$a=\frac{5}{8}\quad;\quad r=\frac{1}{2}\quad;\quad n=21$ $S_n=\frac{a(1-r^n)}{1-r}$ $S_{21}=\frac{\frac{5}{8}\left(1-\left(\frac{1}{2}\right)^{21}\right)}{1-\frac{1}{2}}$ $=1{,}2499...$ $=1{,}25$	✓ r ✓ substitution into the correct formula ✓ answer (3)
2.2.2	$T_n>\frac{5}{8192}$ $ar^{n-1}>\frac{5}{8192}$ $\frac{5}{8}\left(\frac{1}{2}\right)^{n-1}>\frac{5}{8192}$ $\left(\frac{1}{2}\right)^{n-1}>\frac{1}{1024}$ $\left(\frac{1}{2}\right)^{n-1}>\left(\frac{1}{2}\right)^{10}$ *or* $2^{-n+1}>2^{-10}$ $\therefore n-1<10$ $\quad -n+1>-10$ $n<11$ $\quad n<11$ $\therefore n=10$ $\quad \therefore n=10$ **OR/OF** 8 ; 16 ; 32 ; … ; 8192 $8.2^{n-1}<8192$ $2^{n-1}<1024$ $2^{n-1}<2^{10}$ $n-1<10$ $n<11$ $\therefore n=10$	✓ substitution into the correct formula ✓ method /same base or log ✓calculating n ✓ answer (4) **OR/OF** ✓ substitution into the correct formula ✓ method ✓calculating n ✓ answer (4)
		[19]

QUESTION/*VRAAG* 3

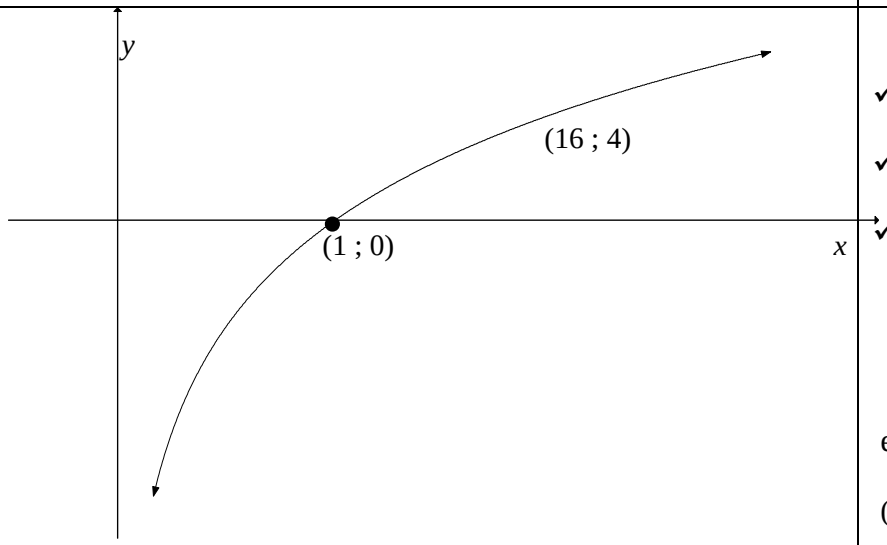
3.1	$\sum_{y=3}^{10}\frac{1}{y-2}-\sum_{y=3}^{10}\frac{1}{y-1}$ $=\left(\frac{1}{1}+\frac{1}{2}+\frac{1}{3}+....+\frac{1}{8}\right)-\left(\frac{1}{2}+\frac{1}{3}+....+\frac{1}{8}+\frac{1}{9}\right)$ $=1-\frac{1}{9}$ $=\frac{8}{9}$	✓ $\left(\frac{1}{1}+\frac{1}{2}+\frac{1}{3}+....+\frac{1}{8}\right)$ ✓$\left(\frac{1}{2}+\frac{1}{3}+....+\frac{1}{8}+\frac{1}{9}\right)$ ✓answer (3)
3.2	$\left(\frac{1}{3}\times\frac{2}{3}\right)+\left(\frac{2}{3}\times\frac{2}{3}\right)+\left(1\times\frac{2}{3}\right)+....+\left(4\times\frac{2}{3}\right)$ $=\frac{2}{9}+\frac{4}{9}+\frac{2}{3}+....+\frac{8}{3}$ $a=\frac{2}{9}$ and $d=\frac{2}{3}-\frac{4}{9}=\frac{2}{9}$ $S_n=\frac{n}{2}[2a+(n-1)d]$ OR $S_n=\frac{n}{2}(a+l)$ $S_{12}=\frac{12}{2}\left[2\left(\frac{2}{9}\right)+(12-1)\frac{2}{9}\right]$ $S_{12}=\frac{12}{2}\left(\frac{2}{9}+\frac{8}{3}\right)$ $=\frac{52}{3}\text{m}^2$ $=\frac{52}{3}\text{m}^2$ $\therefore$ for both sides $=2\times\frac{52}{3}=\frac{104}{3}=34{,}67\text{m}^2$ **OR/OF** $\frac{2}{9}\times(1+2+3+4+5+6+7+8+9+10+11+12)\times 2$ $=34{,}67\text{ m}^2$ **OR/OF** $T_1=\frac{2}{9}\times 12=\frac{8}{3}$ $l=\frac{2}{9}\times 1=\frac{2}{9}$ $2S_{12}=2\left(\frac{12}{2}\right)\left(\frac{8}{3}+\frac{2}{9}\right)$ $=34{,}67\text{ m}^2$	✓✓a ✓d ✓ substitution into the correct formula ✓ answer ✓ answer for both sides (6) **OR/OF** ✓✓ a ✓✓ $(1 + ... + 12)$ ✓ $\times 2$ ✓ answer (6) **OR/OF** ✓✓ a ✓ $T_1=\frac{8}{3}$✓ $l=\frac{2}{9}$ ✓ substitution into correct formula ✓ answer (6)
		[9]

QUESTION/*VRAAG* 4

4.1	$p=-1$	✓ $p=-1$ (1)
4.2	$y=\frac{a}{x-1}$ $-3=\frac{a}{0-1}$ $a=3$ $y=x^2+bx-3$ $0=(1)^2+(1)b-3$ $b=2$	✓coordinates D(0 ; –3) ✓substitute (0 ; –3) ✓substitute (1 ; 0) (3)
4.3	$y=x^2+2x-3$ axis of sym: $x=\frac{-b}{2a}$ $x=\frac{-2}{2(1)}$ $x=-1$ $y=(-1)^2+2(-1)-3=-4$ C$(-1;-4)$ **OR/OF** $\frac{dy}{dx}=0$ $2x+2=0$ $x=-1$ $y=(-1)^2+2(-1)-3=-4$ C$(-1;-4)$	✓substitution ✓ $x=-1$ ✓substitution ✓$y=-4$ (4) **OR/OF** ✓derivative ✓ $x=-1$ ✓substitution ✓$y=-4$ (4)
4.4	$y\in[-4;\infty)$ or $y\geq -4$	✓ -4 ✓ answer (2)
4.5	$m=\tan 45°=1$ $y=mx+c$ $-4=(1)(-1)+c$ $c=-3$ $y=x-3$	✓gradient ✓subs m and $(-1;-4)$ ✓equation (3)
4.6	No, the line passes through C and D **OR/OF** No, a tangent through turning point C will have a gradient of 0	✓ No ✓ reason (2) **OR/OF** ✓ No ✓ reason (2)

4.7	$f(m-x)=f[-(x-m)]$ f is reflected in the y-axis and translated 1 unit to the left and 4 units upwards. Therefore: $m=-1$ $q=4$ **OR/OF** Substitute $x=0$ and $q=4$ for one x- intercept $h(x)=(m-x)^2+2(m-x)-3+q$ $h(0)=(m-0)^2+2(m-0)-3+4$ $0=m^2+2m+1$ $0=(m+1)^2$ $m=-1$ $q=4$	✓✓value of m ✓✓ value of q (4) **OR/OF** ✓✓value of m ✓✓ value of q (4)
		[19]

QUESTION/*VRAAG* 5

5.1	$f(x)=k^x$ $16=k^4$ $k=2$	✓substitution (4 ; 16) ✓answer (2)
5.2	$f:\quad y=2^x$ $f^{-1}:\quad x=2^y$ $y=\log_2 x$	✓ $x=2^y$ ✓ $y=\log_2 x$ (2)
5.3		✓asymptote ✓shape ✓✓for any two valid points eg.(16 ; 4) or (2 ; 1) or (4 ; 2) or (1 ; 0) (4)
5.4.1	$x\in(1;\infty)$ or $x>1$	✓1 ✓ answer (2)
5.4.2	$0<x\leq\frac{1}{2}$ or $x\in\left(0;\frac{1}{2}\right]$	✓$\frac{1}{2}$ ✓ answer (2)

5.5	$2^x - 2^{-x} = \frac{15}{4}$ $2^x - \frac{1}{2^x} = \frac{15}{4}$ $2^{2x} - 1 = \frac{15}{4} \times 2^x$ $4.2^{2x} - 4 = 15 \times 2^x$ $4.2^{2x} - 15.2^x - 4 = 0$ $(4.2^x + 1)(2^x - 4) = 0$ $4.2^x + 1 = 0$ or $2^x - 4 = 0$ $2^x = \frac{-1}{4}$ or $2^x = 2^2$ N/A $x = 2$ **OR/OF** $2^x - 2^{-x} = \frac{15}{4}$ $2^x - \frac{1}{2^x} = \frac{15}{4}$ Let $k = 2^x$ $k^2 - 1 = \frac{15}{4} \times k$ $4.k^2 - 4 = 15 \times k$ $4.k^2 - 15.k - 4 = 0$ $(4.k + 1)(k - 4) = 0$ $k = \frac{-1}{4}$ or $k = 4$ $2^x = \frac{-1}{4}$ or $2^x = 2^2$ N/A $x = 2$	✓ $2^x - 2^{-x} = \frac{15}{4}$ ✓standard form ✓factors ✓answer (4) **OR/OF** ✓ $2^x - 2^{-x} = \frac{15}{4}$ ✓standard form ✓factors ✓answer (4)
		[16]

QUESTION/*VRAAG* 6

6.1	Kuda : $A = P(1+in)$ $= 5\ 000(1+0{,}083\times 4)$ $= R6\ 660{,}00$ Final Answer : R6 660,00 + R266,40 $= R6\ 926{,}40$ **OR/OF** Kuda : $A = P(1+in)\times 1{,}04$ $= 5\ 000(1+0{,}083\times 4)\times 1{,}04$ $= R6\ 926{,}40$ Thabo : $A = P(1+i)^n$ $= 5\ 000\left(1+\frac{0{,}081}{12}\right)^{12\times 4}$ $= R6\ 905{,}71$ Kuda will have a better investment	✓substitution into the correct formula ✓final answer **OR/OF** ✓substitution into the correct formula ✓final answer ✓substitution into the correct formula ✓answer ✓conclusion (5)
6.2.1	$P = \frac{x[1-(1+i)^{-n}]}{i}$ $525\ 000 = \frac{6\ 000\left[1-\left(1+\frac{0{,}1}{12}\right)^{-n}\right]}{\frac{0{,}1}{12}}$ $\frac{35}{48} = 1-\left(1+\frac{0{,}1}{12}\right)^{-n}$ $-n\log\left(1+\frac{0{,}1}{12}\right) = \log\frac{13}{48}$ $-n = \frac{\log\frac{13}{48}}{\log\left(1+\frac{0{,}1}{12}\right)}$ $n = 157{,}40$ n = 158 payments **OR/OF**	✓$\frac{0{,}1}{12}$ ✓substitution into the correct formula ✓simplification ✓use of logs ✓answer (5) **OR/OF**

	$P = \frac{x[1-(1+i)^{-n}]}{i}$ $525\,000 = \frac{6\,000\left[1-\left(1+\frac{0,1}{12}\right)^{-12n}\right]}{\frac{0,1}{12}}$ $\frac{35}{48} = 1-\left(1+\frac{0,1}{12}\right)^{-12n}$ $-12n\log\left(1+\frac{0,1}{12}\right) = \log\frac{13}{48}$ $-12n = \frac{\log\frac{13}{48}}{\log\left(1+\frac{0,1}{12}\right)}$ $n = \frac{\log\frac{13}{48}}{\log\left(1+\frac{0,1}{12}\right)} \times \frac{1}{12}$ $n = 13,11686841$ Number of payments = $13,11686841 \times 12 = 157,40$ n = 158 payments	✓ $\frac{0,1}{12}$ ✓substitution into the correct formula ✓simplification ✓use of logs ✓answer (5)
6.2.2	Difference: R6 000 – R5 066,36 = R933,64 $F = \frac{x[(1+i)^n - 1]}{i}$ $F = \frac{933,64\left[\left(1+\frac{0,1}{12}\right)^{108} - 1\right]}{\frac{0,1}{12}}$ $= R162\,503,51$ **OR/OF**	✓ R933,64 ✓ n = 108 ✓ substitution into the correct formula ✓ answer (4) **OR/OF**

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

$$F = \frac{6\,000\left[\left(1+\frac{0{,}1}{12}\right)^{108} - 1\right]}{\frac{0{,}1}{12}}$$

$= \text{R}1\,044\,322{,}28$

✓ $n = 108$
✓substitution into correct formula

$$F = \frac{5\,066{,}36\left[\left(1+\frac{0{,}1}{12}\right)^{108} - 1\right]}{\frac{0{,}1}{12}}$$

$F = \text{R}881\,818{,}77.....$

✓ substitution into correct formula

Amount available for withdrawal
= R1 044 322,28 – R 881 818,77
= R162 503,51

✓final answer (4)

OR/OF

Outstanding balance with monthly repayment of R5 066,35

$$= 525\,000\left(1+\frac{0{,}1}{12}\right)^{108} - \frac{5\,066{,}36\left[\left(1+\frac{0{,}1}{12}\right)^{108} - 1\right]}{\frac{0{,}1}{12}}$$

= R404 666, 23

✓$n = 108$
✓substitution into the correct formula

Outstanding balance with monthly repayment of R6 000

$$= 525\,000\left(1+\frac{0{,}1}{12}\right)^{108} - \frac{6\,000\left[\left(1+\frac{0{,}1}{12}\right)^{108} - 1\right]}{\frac{0{,}1}{12}}$$

= R242 162,72

✓ substitution into the correct formula

Amount available for withdrawal
R404 666,23 – R242 162,72 = R162 512,18

✓final answer (4)

[14]

QUESTION/*VRAAG* 7

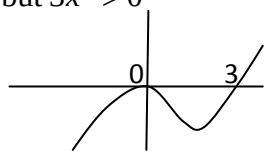
7.1	$f(x)=4-7x$ $f'(x)=\lim\limits_{h\to 0}\dfrac{f(x+h)-f(x)}{h}$ $=\lim\limits_{h\to 0}\dfrac{4-7(x+h)-(4-7x)}{h}$ $=\lim\limits_{h\to 0}\dfrac{h(-7)}{h}$ $=-7$	✓ $4-7(x+h)$ ✓substitution ✓simplification ✓answer (4)
7.2	$y=4x^8+\sqrt{x^3}$ $=4x^8+x^{\frac{3}{2}}$ $\dfrac{dy}{dx}=32x^7+\dfrac{3}{2}x^{\frac{1}{2}}$	✓ $x^{\frac{3}{2}}$ ✓ $32x^7$ ✓ $\dfrac{3}{2}x^{\frac{1}{2}}$ (3)
7.3.1	$y=ax^2+a$ $\dfrac{dy}{dx}=2ax+0$ $\dfrac{dy}{dx}=2ax$	✓ $2ax$ (1)
7.3.2	$y=ax^2+a$ $\dfrac{dy}{da}=x^2+1$	✓ ✓ answer (2)

7.4	Substitute (2 ; b) in $y = x + \frac{12}{x}$ $b = 2 + \frac{12}{2}$ $b = 8$ $m_{\text{tangent}} = \frac{dy}{dx}$ $\frac{dy}{dx} = 1 - \frac{12}{x^2}$ $m_{\text{tangent}} = 1 - \frac{12}{2^2} = -2$ $m_{\text{perp}} = \frac{1}{2}$ Equation of perpendicular line: $y - y_1 = m(x - x_1)$ OR $y = mx + c$ $y - 8 = \frac{1}{2}(x - 2)$ $8 = \frac{1}{2}(2) + c$ $y = \frac{1}{2}x + 7$ $c = 7$ $y = \frac{1}{2}x + 7$	✓ value of b ✓ $\frac{dy}{dx} = 1 - \frac{12}{x^2}$ ✓gradient of perpendicular line ✓ equation (4)
		[14]

QUESTION/*VRAAG* 8

8.1	36cm	✓answer (1)
8.2	$\therefore t = 6$ $(-2t^2 + 3t - 6)$ have no real roots Insect reaches the floor only once.	✓✓✓ only once (3)
8.3	$h(t) = -2t^3 + 15t^2 - 24t + 36$ $h'(t) = -6t^2 + 30t - 24$ $-6t^2 + 30t - 24 = 0$ $t^2 - 5t + 4 = 0$ $(t - 4)(t - 1) = 0$ $t = 4$ or $t = 1$ Only $t = 4$ because maximum value required $h = -2(4)^3 + 15(4)^2 - 24(4) + 36 = 52\ cm$	✓ expansion ✓ $-6t^2 + 30t - 24 = 0$ ✓both values ✓answer (4)
		[8]

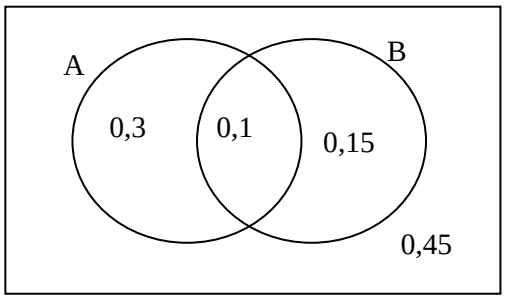
QUESTION/*VRAAG* 9

9.1	$f'(x) = 9x^2$ $3x^3 = 9x^2$ $3x^3 - 9x^2 = 0$ $3x^2(x-3) = 0$ $x = 0$ or $x = 3$	✓ $f'(x) = 9x^2$ ✓ $x = 0$ ✓ $x = 3$ (3)
9.2.1	For f and f'	✓ answer (1)
9.2.2	The point (0 ; 0) is : A point of inflection of f A turning point of f'	✓ f : inflection point ✓ f' : turning point (2)
9.3	$f''(x) = 18x$ Distance $= f''(1) - f'(1)$ $= 18(1) - 9(1)^2$ $= 9$	✓ $f''(x) = 18x$ ✓substitution ✓answer (3)
9.4	$3x^3 - 9x^2 < 0$ $3x^2(x-3) < 0$ but $3x^2 > 0$  $\therefore x - 3 < 0$ $\therefore x < 3$, $x \neq 0$	✓ $3x^3 - 9x^2 < 0$ ✓ factors ✓ $x < 3$ ✓ $x \neq 0$ (4)
		[13]

QUESTION/*VRAAG* 10

10.1	P(same day) $= \frac{4}{16}$ or $\frac{1}{4}$ or 0,25 or 25%	✓4 numerator ✓16 denominator (2)
10.2	P(2 consecutive days) $= \frac{3 \times 2}{16} = \frac{3}{8}$	✓3 ✓$\times$2 ✓ answer (3)
		[5]

QUESTION/*VRAAG* 11

11.1.1	$P(A) \times P(B)$ independent events $= 0,40 \times 0,25 = 0,1$  	✓0,1 ✓0,15 and 0,3 ✓0,45 (3)
11.1.2	$P(\text{A or not B}) = P(\text{A}) + P(\text{not B}) - P(\text{A and not B})$ $= 0,4 + 0,75 - 0,3$ $= 0,85$ **OR/OF** $P(\text{A or not B}) = 1 - P(\text{only B})$ $= 1 - 0,15$ $= 0,85$ **OR/OF** From Venn diagram: 0,3 + 0,1 + 0,45 = 0,85	✓ substitution ✓answer (2) **OR/OF** ✓ 1 – 0,15 ✓answer (2) **OR/OF** ✓ substitution ✓ answer (2)
11.2	$(5 \times 1 \times 5) + (5 \times 1 \times 6) + (5 \times 1 \times 6) + (5 \times 1 \times 5) = 110$ $110 \times 5 = 550 > 500$ Not possible, because not enough space **OR/OF** $(5 \times 2 \times 5) + (5 \times 2 \times 6) = 110$ $110 \times 5 = 550 > 500$ Not possible because not enough space **OR/OF**	✓5 × 1 × 5 ✓5 × 1 × 6 ✓5 × 1 × 6 ✓5 × 1 × 5 ✓110 ✓ conclusion (6) **OR/OF** ✓✓5 × 2 × 5 ✓✓5 × 2 × 6 ✓ 110 ✓ conclusion (6) **OR/OF**

	$5\times4\times6=120$ $5\times2=10$ $\therefore 120-10=110$ $110 \times 5 = 550 > 500$ Not possible because not enough space	✓✓ $5\times4\times6=120$ ✓ $5\times2=10$ ✓ $120-10$ ✓ 110 ✓ conclusion (6)
		[11]

TOTAL/*TOTAAL:* 150