basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

NASIONALE SENIOR SERTIFIKAAT

GRAAD 12

WISKUNDE V1

FEBRUARIE/MAART 2018

PUNTE: 150

TYD: 3 uur

Hierdie vraestel bestaan uit 9 bladsye en 1 inligtingsblad.

INSTRUKSIES EN INLIGTING

Lees die volgende instruksies aandagtig deur voordat jy die vrae beantwoord.

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, ensovoorts 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 $x^2 - 6x - 16 = 0$ (3)

1.1.2 $2x^2 + 7x - 1 = 0$ (korrek tot TWEE desimale plekke) (4)

1.2 Maak 'n lys van al die heelgetalle wat oplossings is vir $x^2 - 25 < 0$. (4)

1.3 Los op vir x en y:

$-2y + x = -1$ en $x^2 - 7 - y^2 = -y$ (6)

1.4 Evalueer: $\dfrac{3^{2018} + 3^{2016}}{3^{2017}}$ (2)

1.5 Gegee: $t(x) = \dfrac{\sqrt{3x-5}}{x-3}$

1.5.1 Vir watter waardes van x sal $\dfrac{\sqrt{3x-5}}{x-3}$ reëel wees? (3)

1.5.2 Los op vir x indien $t(x) = 1$. (4)

[26]

VRAAG 2

2.1 Gegee die volgende meetkundige ry: $30 \; ; \; 10 \; ; \; \dfrac{10}{3} \; ; \ldots$

2.1.1 Bepaal n indien die n^{de} term van die ry gelyk is aan $\dfrac{10}{729}$. (4)

2.1.2 Bereken: $30 + 10 + \dfrac{10}{3} + \ldots$ (2)

2.2 Lei 'n formule af vir die som van die eerste n terme van 'n rekenkundige ry indien die eerste term van die ry a en die gemene verskil d is. (4)

[10]

VRAAG 3

Die eerste drie terme van 'n rekenkundige ry is -1 ; 2 en 5.

3.1 Bepaal die n^{de} term, T_n, van die ry. (2)

3.2 Bereken T_{43}. (2)

3.3 Evalueer $\sum_{k=1}^{n} T_k$ in terme van n. (3)

3.4 'n Kwadratiese ry, met algemene term T_n, het die volgende eienskappe:

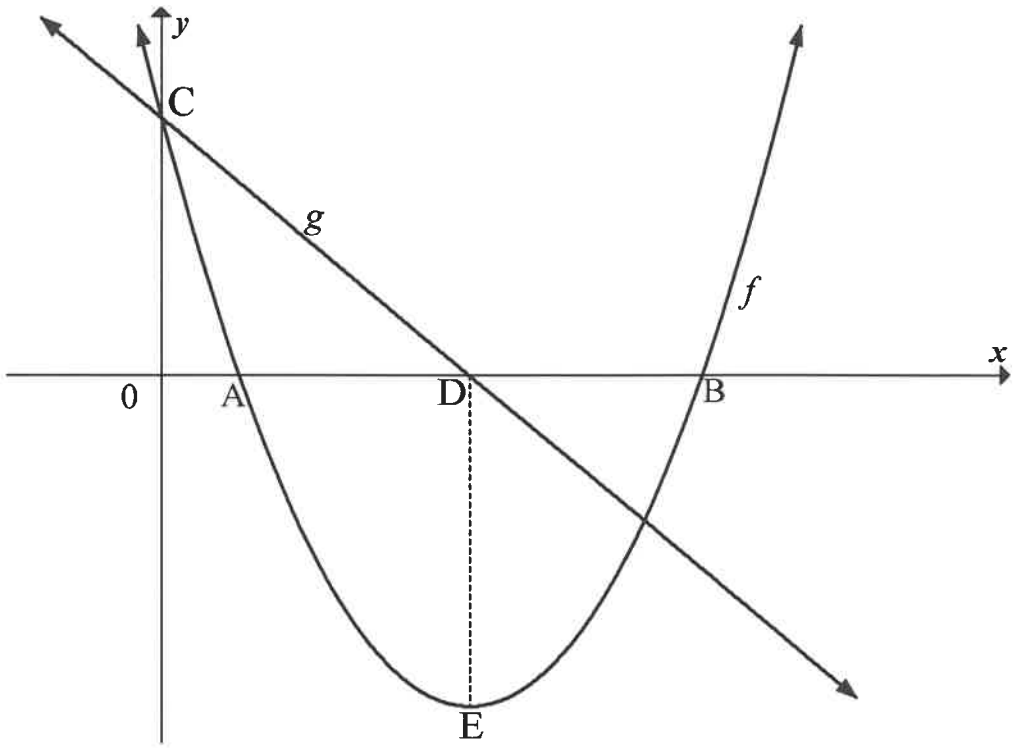
- $T_{11} = 125$
- $T_n - T_{n-1} = 3n - 4$

Bepaal die eerste term van die ry. (6)
[13]

VRAAG 4

Hieronder is die grafieke van $f(x) = (x-4)^2 - 9$ en 'n reguitlyn g.

- A en B is die x-afsnitte van f en E is die draaipunt van f.
- C is die y-afsnit van beide f en g.
- Die x-afsnit van g is D. DE is parallel aan die y-as.



4.1 Skryf die koördinate van E neer. (2)

4.2 Bereken die koördinate van A. (3)

4.3 M is die refleksie van C in f se simmetrie-as. Skryf die koördinate van M neer. (3)

4.4 Bepaal die vergelyking van g in die vorm $y = mx + c$. (3)

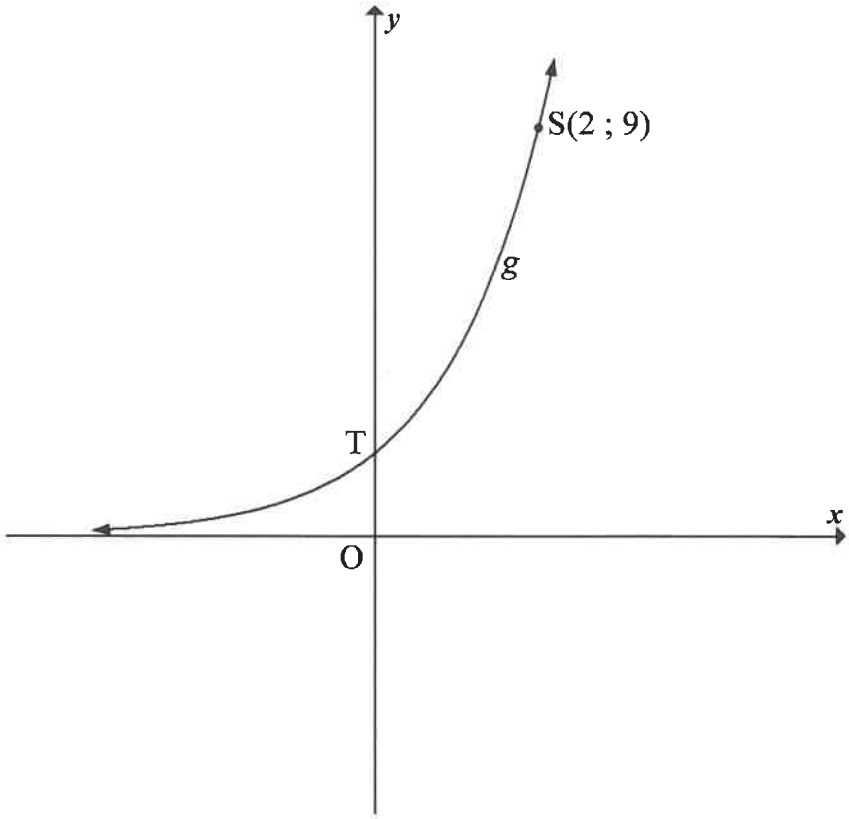
4.5 Skryf die vergelyking van g^{-1} neer in die vorm $y = \ldots$ (3)

4.6 Vir watter waardes van x sal $x(f(x)) \leq 0$? (4)

[18]

VRAAG 5

Die grafiek van $g(x) = a^x$ is in die skets hieronder geteken. Die punt S(2 ; 9) lê op g. T is die y-afsnit van g.



5.1 Skryf die koördinate van T neer. (2)

5.2 Bereken die waarde van a. (2)

5.3 Die grafiek h word verkry deur g in die y-as te reflekteer. Skryf die vergelyking van h neer. (2)

5.4 Skryf die waardes van x neer waarvoor $0 < \log_3 x < 1$. (2)
[8]

VRAAG 6

Die funksie f, gedefinieer deur $f(x)=\frac{a}{x+p}+q$, het die volgende eienskappe:

- Die waardeversameling van f is $y \in R, y \neq 1$.
- Die grafiek f gaan deur die oorsprong.
- $P\left(\sqrt{2}+2;\sqrt{2}+1\right)$ lê op die grafiek f.

6.1 Skryf die waarde van q neer. (1)

6.2 Bereken die waardes van a en p. (5)

6.3 Skets 'n netjiese grafiek van hierdie funksie. Jou grafiek moet die asimptote insluit, indien enige. (4)
[10]

VRAAG 7

7.1 Asif deponeer op 30 Junie 2013 en aan die einde van elke daaropvolgende maand R2 500 in 'n bankrekening wat 6% rente per jaar, maandeliks saamgestel, verdien. Hy wil aanhou om hierdie bedrag tot 31 Mei 2018 te deponeer.

Bereken hoeveel geld Asif in hierdie rekening sal hê onmiddellik nadat hy R2 500 op 31 Mei 2018 gedeponeer het. (3)

7.2 Genevieve neem op 1 Februarie 2018 'n lening van R82 000 by die bank uit om vir haar studies te betaal. Sy sal haar eerste terugbetaling van R3 200 op 1 Februarie 2019 maak en dan voortgaan om op die eerste dag van elke maand daarna R3 200 te betaal totdat sy haar lening vereffen het. Die bank vra rente teen 15% per jaar, maandeliks saamgestel.

7.2.1 Bereken hoeveel Genevieve die bank op 1 Januarie 2019 sal skuld. (3)

7.2.2 Hoeveel paaiemente van R3 200 moet sy betaal? (5)

7.2.3 Bereken die laaste paaiement, tot die naaste rand, wat Genevieve moet betaal om die lening te vereffen. (5)
[16]

VRAAG 8

8.1 Bepaal $f'(x)$ vanuit eerste beginsels as $f(x) = 4x^2$. (5)

8.2 Bepaal:

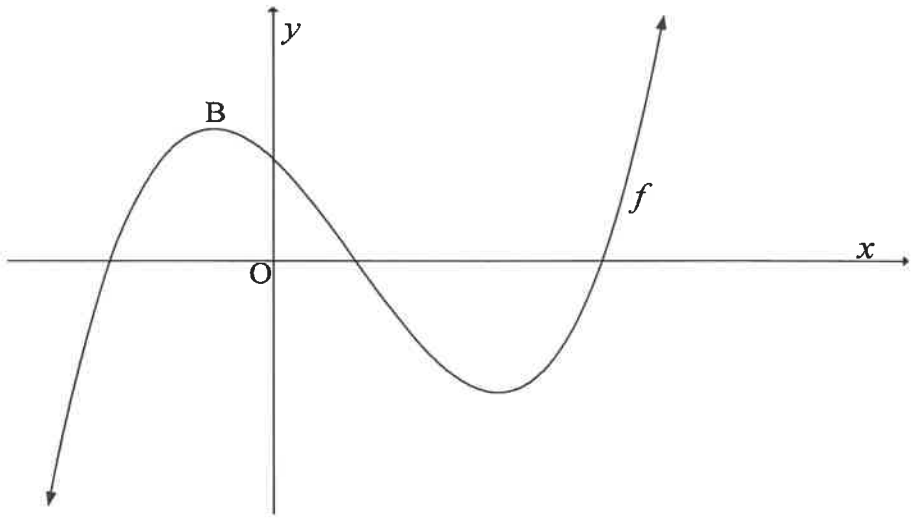
8.2.1 $D_x\left[\frac{x^2-2x-3}{x+1}\right]$ (3)

8.2.2 $f''(x)$ as $f(x)=\sqrt{x}$ (3)

[11]

VRAAG 9

Die skets hieronder stel die kurwe van $f(x)=x^3+bx^2+cx+d$ voor. Die oplossings van die vergelyking $f(x)=0$ is –2 ; 1 en 4.



9.1 Bereken die waardes van b, c en d. (4)

9.2 Bereken die x-koördinaat van B, die maksimum draaipunt van f. (4)

9.3 Bepaal 'n vergelyking vir die raaklyn aan die grafiek van f by $x=-1$. (4)

9.4 Skets die grafiek van $f''(x)$ in die ANTWOORDEBOEK. Toon die x- en y-afsnitte duidelik op jou skets aan. (3)

9.5 Vir watter waarde(s) van x is $f(x)$ konkaaf na bo? (2)

[17]

VRAAG 10

Gegee: $f(x) = -3x^3 + x$.

Bereken die waarde van q waarvoor $f(x) + q$ 'n maksimum waarde van $\frac{8}{9}$ sal hê. **[6]**

VRAAG 11

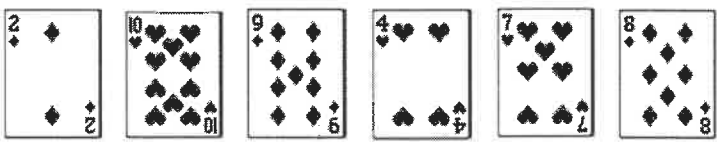
11.1 Veli en Bongi is leerders by dieselfde skool. Hulle kom party dae laat by die skool aan. Die waarskynlikheid dat nóg Veli nóg Bongi op 'n spesifieke dag laat sal kom, is 0,7.

11.1.1 Bereken die waarskynlikheid dat ten minste een van die twee leerders op 'n dag wat willekeurig gekies is, laat by die skool sal aankom. (1)

11.1.2 Die waarskynlikheid dat Veli op 'n dag wat willekeurig gekies is, laat by die skool sal aankom, is 0,25, terwyl die waarskynlikheid dat hulle albei op daardie dag laat sal wees, 0,15 is. Bereken die waarskynlikheid dat Bongi op daardie dag laat by die skool sal aankom. (3)

11.1.3 Die skoolhoof vermoed dat daar 'n verband tussen die twee leerders se laatkommery is. Die skoolhoof vra jou om te bepaal of die gebeure van Veli wat laat by die skool kom en Bongi wat laat by die skool kom, statisties onafhanklik is, of nie. Wat sal jou antwoord aan hom wees? Toon ALLE berekeninge. (3)

11.2 Die kaarte hieronder word van links na regs in 'n ry geplaas.



11.2.1 Op hoeveel verskillende maniere kan hierdie 6 kaarte willekeurig in 'n ry geplaas word? (2)

11.2.2 Op hoeveel verskillende maniere kan hierdie kaarte in 'n ry geplaas word indien die diamante en harte afwisselend geplaas word? (3)

11.2.3 Indien hierdie kaarte willekeurig in 'n ry geplaas word, bereken die waarskynlikheid dat AL die harte langs mekaar sal wees. (3)
[15]

TOTAAL: 150

INLIGTINGSBLAD: WISKUNDE

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$\sin 2\alpha = 2\sin\alpha.\cos\alpha$

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

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

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

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NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE 12/*GRAAD* 12

MATHEMATICS P1/*WISKUNDE V1*

FEBRUARY/MARCH/*FEBRUARIE/MAART* 2018

MARKING GUIDELINES/*NASIENRIGLYNE*

MARKS/*PUNTE*: 150

These marking guidelines consist of 17 pages./
Hierdie nasienriglyne bestaan uit* 17 *bladsye.

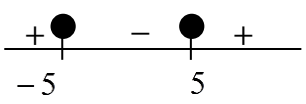
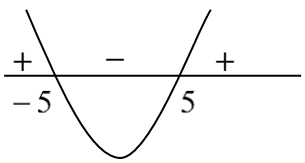
NOTE:

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

QUESTION/*VRAAG* 1

1.1.1	$x^2-6x-16=0$ $(x-8)(x+2)=0$ $x=-2$ or $x=8$	✓ factors ✓ $x=-2$ ✓ $x=8$ (3)
1.1.2	$2x^2+7x-1=0$ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\frac{-(7)\pm\sqrt{(7)^2-4(2)(-1)}}{2(2)}$ $=\frac{-7\pm\sqrt{57}}{4}$ $x=0{,}14$ or $x=-3{,}64$ NOTE: Penalise 1 mark if the rounding to TWO decimal places is incorrect. **OR/*OF*** $x^2+\frac{7}{2}x+\frac{49}{16}=\frac{1}{2}+\frac{49}{16}$ $\left(x+\frac{7}{4}\right)^2=\frac{57}{16}$ $x+\frac{7}{4}=\pm\frac{\sqrt{57}}{4}$ $x=\frac{-7\pm\sqrt{57}}{4}$ $x=0{,}14$ or $x=-3{,}64$	✓subs into correct formula ✓$\frac{-7\pm\sqrt{57}}{4}$ ✓ $x=0{,}14$ ✓ $x=-3{,}64$ **OR/*OF*** ✓for adding $\frac{49}{16}$ on both sides ✓$\frac{-7\pm\sqrt{57}}{4}$ ✓ $x=0{,}14$ ✓ $x=-3{,}64$ (4)
1.2	$x^2-25<0$ $(x-5)(x+5)<0$   $-5<x<5$ $x=\{-4;-3;-2;-1;0;1;2;3;4\}$ NOTE: Final answer only 2 / 2	✓factors ✓✓inequality ✓answer (4)

1.3	$x = 2y - 1$ $(2y-1)^2 - 7 - y^2 = -y$ $4y^2 - 4y + 1 - 7 - y^2 = -y$ $3y^2 - 3y - 6 = 0$ $y^2 - y - 2 = 0$ $(y-2)(y+1) = 0$ $y = 2$ or $y = -1$ $x = 2(2) - 1$ or $x = 2(-1) - 1$ $x = 3$ or $x = -3$ **OR/*OF*** $y = \frac{x+1}{2}$ $x^2 - 7 - y^2 = -y$ $x^2 - 7 - \left(\frac{x+1}{2}\right)^2 = -\left(\frac{x+1}{2}\right)$ $x^2 - 7 - \left(\frac{x^2+2x+1}{4}\right) = \frac{-x-1}{2}$ $4x^2 - 28 - x^2 - 2x - 1 = -2x - 2$ $3x^2 - 27 = 0$ $x^2 - 9 = 0$ $(x-3)(x+3) = 0$ $x = -3$ or $x = 3$ $y = \frac{-3+1}{2}$ or $y = \frac{3+1}{2}$ $y = -1$ or $y = 2$	✓ $x = 2y - 1$ ✓ substitution ✓ correct standard form ✓ factors ✓ y – values ✓ x – values **OR/*OF*** ✓ $y = \frac{x+1}{2}$ ✓ substitution ✓ correct standard form ✓ factors ✓ x – values ✓ y – values (6)
1.4	$\frac{3^{2018} + 3^{2016}}{3^{2017}}$ $= \frac{3^{2017}(3^1 + 3^{-1})}{3^{2017}}$ $= 3 + \frac{1}{3}$ $= 3\frac{1}{3}$ or $\frac{10}{3}$ **OR/*OF***	✓ common factor 3^{2017} ✓ answer **OR/*OF***

	$\frac{3^{2018}+3^{2016}}{3^{2017}}$ $=\frac{3^{2016}\left(3^2+1\right)}{3^{2017}}$ $=\frac{10}{3}$ **OR/*OF*** $\frac{3^{2018}+3^{2016}}{3^{2017}}$ $=\frac{3^{2018}}{3^{2017}}+\frac{3^{2016}}{3^{2017}}$ $=3+\frac{1}{3}$ $=3\frac{1}{3}$ or $\frac{10}{3}$	✓ common factor 3^{2016} ✓ answer **OR/*OF*** ✓ dividing by 3^{2017} ✓ answer (2)
1.5.1	$3x-5\geq 0$ and $x\neq 3$ $x\geq\frac{5}{3}$ and $x\neq 3$	✓ $3x-5\geq 0$ ✓ $x\geq\frac{5}{3}$ ✓ $x\neq 3$ (3)
1.5.2	$\frac{\sqrt{3x-5}}{x-3}=1$ $\sqrt{3x-5}=x-3$ $3x-5=(x-3)^2$ $3x-5=x^2-6x+9$ $x^2-9x+14=0$ $(x-7)(x-2)=0$ $x\neq 2$ or $x=7$ NOTE: If $x = 2$ is not rejected, then maximum 3 / 4 marks	✓ $\sqrt{3x-5}=x-3$ ✓ $3x-5=(x-3)^2$ ✓ factors ✓ $x=7$ (4) **[26]**

QUESTION/*VRAAG* 2

2.1.1	$30\ ;\ 10\ ;\ \frac{10}{3}\ \ldots\ldots$ $a = 30 \qquad r = \frac{1}{3}$ $T_n = ar^{n-1}$ $\frac{10}{729} = 30\left(\frac{1}{3}\right)^{n-1}$ $\frac{1}{2187} = 3^{1-n}$ $3^{-7} = 3^{1-n}$ $-7 = 1-n$ $n = 8$ **OR/*OF*** $\frac{1}{2187} = \left(\frac{1}{3}\right)^{n-1}$ $\left(\frac{1}{3}\right)^{7} = \left(\frac{1}{3}\right)^{n-1}$ $7 = n-1$ $n = 8$	✓ $r = \frac{1}{3}$ ✓substitution into correct formula ✓ $3^{-7} = 3^{1-n}$ or $\left(\frac{1}{3}\right)^{7} = \left(\frac{1}{3}\right)^{n-1}$ or use of logs ✓ $n = 8$ (4)
2.1.2	$S_\infty = \frac{a}{1-r}$ $= \frac{30}{1-\frac{1}{3}}$ $= 45$	✓substitution into correct formula ✓answer (2)
2.2	$S_n = a + (a+d) + \ldots\ldots + (a+(n-2)d) + (a+(n-1)d) \quad (1)$ $S_n = (a+(n-1)d) + (a+(n-2)d) + \ldots\ldots\ldots + (a+d) + a \quad (2)$ Adding both equations/*Tel die twee vergelykings bymekaar:* $2S_n = 2a + (n-1)d + 2a + (n-1)d + 2a + (n-1)d + \ldots\ldots\ldots\ldots$ $= n[2a + (n-1)d]$ $S_n = \frac{n}{2}[2a + (n-1)d]$ **OR/OF** $S_n = a + (a+d) + \ldots\ldots + (a+(n-2)d) + T_n \quad (1)$ $S_n = T_n + (T_n - d) + (T_n - 2d) + \ldots\ldots\ldots + a \quad (2)$ Adding both equations/*Tel die twee vergelykings bymekaar:* $2S_n = (a+T_n) + (a+T_n) + (a+T_n) + \ldots\ldots + (a+T_n)$ $S_n = \frac{n}{2}(a+T_n)$ but $Tn = a + (n-1)d$ $S_n = \frac{n}{2}[2a + (n-1)d]$	✓expanding S_n ✓reverse writing ✓ $2S_n = n[2a + (n-1)d]$ ✓ $S_n = \frac{n}{2}[2a + (n-1)d]$ (4) ✓expanding S_n ✓reverse writing ✓ $2S_n = n(a + T_n)$ ✓ $S_n = \frac{n}{2}[2a + (n-1)d]$ (4) **[10]**

QUESTION/*VRAAG* 3

3.1	$-1\ ;\ 2\ ;\ 5$ $T_n = -1+(n-1)(3)$ $= 3n-4$	✓ $3n$ ✓ -4 (2)
3.2	$T_{43} = 3(43)-4$ $= 125$ **OR/ OF** $T_{43} = -1+(43-1)(3)$ $= 125$ NOTE: Answer only 2 / 2	✓ subs of 43 ✓ answer (2)
3.3	$T_n = 3n-4$ $S_n = \sum_{k=1}^{n} T_k = -1+2+5+.....+3n-4$ $S_n = \frac{n}{2}[-1+3n-4]$ or $S_n = \frac{n}{2}[-2+(n-1)3]$ $= \frac{n}{2}[3n-5]$ $= \frac{3n^2-5n}{2}$ **OR/*OF*** $T_n = 3n-4$ $\sum_{k=1}^{n} T_k = 3(1)-4+3(2)-4+3(3)-4+.....+3n-4$ $= 3(1+2+3+.....+n)-4n$ $= \frac{3n(n+1)}{2}-4n$ $= \frac{3n^2-5n}{2}$	✓ $S_n = \sum_{k=1}^{n} T_k$ ✓ substitution into correct formula ✓ $\frac{n}{2}[3n-5]$ or $\frac{3n^2-5n}{2}$ **OR/*OF*** ✓ $(1)-4+3(2)-4+3(3)-4+$ $.....+3n-4$ ✓ $3(1+2+3+.....+n)-4n$ ✓ $\frac{3n^2-5n}{2}$ (3)

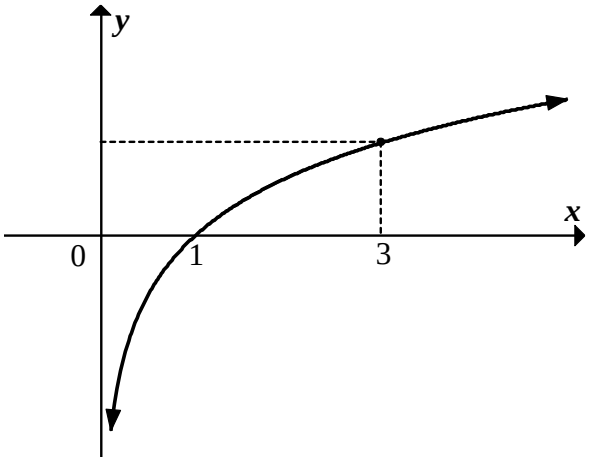
3.4	$T_{11} = (T_{11} - T_{10}) + (T_{10} - T_9) + (T_9 - T_8) + \ldots + (T_3 - T_2) + (T_2 - T_1) + T_1$ $125 = 29 + 26 + 23 + \ldots 2 + T_1$ $= \frac{10}{2}(29 + 2) + T_1$ $= 155 + T_1$ $T_1 = -30$ NOTE: Answer only 1 / 6 If they only use $3n - 4$ breakdown 0 / 6 **OR/*OF*** $T_n = an^2 + bn + c$ $\therefore T_{11} = 121a + 11b + c = 125$ $T_n - T_{n-1} = an^2 + bn + c - \left[a(n-1)^2 + b(n-1) + c\right]$ $= an^2 + bn + c - an^2 + 2an - a - bn + b - c$ $= 2an + b - a$ $T_n - T_{n-1} = 3n - 4$ $2a = 3$ and $b - a = -4$ $a = \frac{3}{2}$ and $b = -\frac{5}{2}$ $121a + 11b + c = 125$ $121\left(\frac{3}{2}\right) + 11\left(-\frac{5}{2}\right) + c = 125$ $c = -29$ $T_n = \frac{3}{2}n^2 - \frac{5}{2}n - 29$ $T_1 = \frac{3}{2}(1)^2 - \frac{5}{2}(1) - 29$ $= -30$	✓✓ generating sum ✓ $29 + 26 + 23 + \ldots 2$ ✓ $\frac{10}{2}(29 + 2)$ ✓ 155 ✓ -30 **OR/*OF*** ✓ $121a + 11b + c = 125$ ✓ calculating $T_n - T_{n-1}$ in terms of *a*, *b* and *c* ✓ $a = \frac{3}{2}$ ✓ $b = -\frac{5}{2}$ ✓ $c = -29$ ✓ -30 (6) **[13]**

QUESTION/*VRAAG* 4

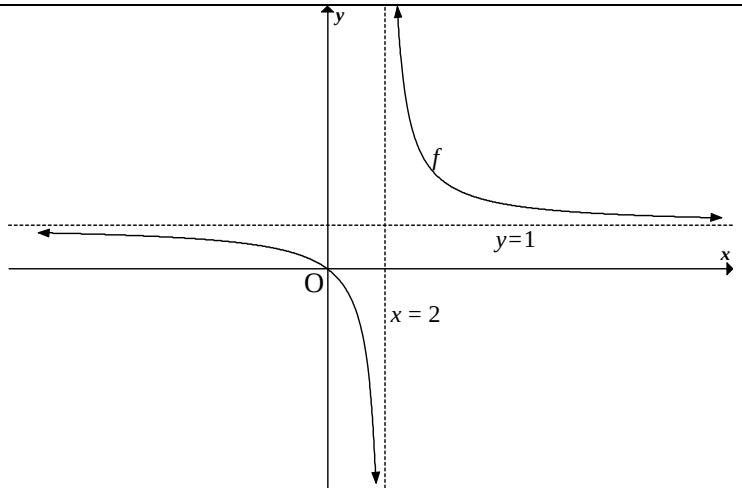
4.1	E(4 ; –9)	✓ $x = 4$ ✓ $y = -9$ (2)
4.2	$f(x) = (x-4)^2 - 9$ $(x-4)^2 - 9 = 0$ $(x-4)^2 = 9$ $x - 4 = \pm 3$ $x = 7$ or $x = 1$ A(1 ; 0) **OR/*OF*** $f(x) = (x-4)^2 - 9$ $0 = x^2 - 8x + 16 - 9$ $0 = x^2 - 8x + 7$ $(x-7)(x-1) = 0$ $x = 7$ or $x = 1$ A(1 ; 0)	✓ $y = 0$ ✓ $x - 4 = \pm 3$ ✓ A(1 ; 0) **OR/*OF*** ✓ $y = 0$ ✓ $(x-7)(x-1)$ ✓ A(1 ; 0) (3)
4.3	C(0 ; 7) M(8 ; 7) NOTE: Answer only 3 / 3	✓ C(0 ; 7) ✓ $x = 8$ ✓ $y = 7$ (3)
4.4	C(0 ; 7) D(4 ; 0) $m = \frac{7-0}{0-4}$ or $m = \frac{0-7}{4-0}$ or $0 = 4m + 7$ $m = -\frac{7}{4}$ $m = -\frac{7}{4}$ $m = -\frac{7}{4}$ $y - 0 = -\frac{7}{4}(x-4)$ $y = -\frac{7}{4}x + 7$	✓ D(4 ; 0) ✓ $m = -\frac{7}{4}$ ✓ $y = -\frac{7}{4}x + 7$ (3)
4.5	$g: y = -\frac{7}{4}x + 7$ $g^{-1}: x = -\frac{7}{4}y + 7$ $4x = -7y + 28$ $7y = -4x + 28$ $y = -\frac{4}{7}x + 4$ **OR/*OF***	✓ interchange x and y ✓ simplification ✓ $y = -\frac{4}{7}x + 4$ **OR/*OF***

	g^{-1} is the straight line through (0 ; 4) and (7 ; 0) $y = mx + 4$ $0 = 7m + 4$ $y = -\frac{4}{7}x + 4$	✓ straight line through (0 ; 4) and (7 ; 0) ✓ substitution ✓ $y = -\frac{4}{7}x + 4$ (3)
4.6	$x \ . \ f(x) \leq 0$ $\therefore x \leq 0$ or $1 \leq x \leq 7$	✓✓ $x \leq 0$ ✓✓ $1 \leq x \leq 7$ (4) **[18]**

QUESTION/*VRAAG* 5

5.1	$a^0 = 1$ T(0 ; 1)	✓ $x = 0$ ✓ $y = 1$ (2)
5.2	$g(x) = a^x$ $9 = a^2$ $a = 3$ $a > 0$	✓ substitution ✓ $a = 3$ (2)
5.3	$y = \left(\frac{1}{3}\right)^x$ or $y = 3^{-x}$	✓✓ $y = \left(\frac{1}{3}\right)^x$ (2)
5.4	$3^0 < 3^{\log_3 x} < 3^1$ $1 < x < 3$ **OR**  $1 < x < 3$	✓ $1 < x$ ✓ $x < 3$ (2) ✓ $1 < x$ ✓ $x < 3$ (2) **[8]**

QUESTION/*VRAAG* 6

6.1	$q=1$	✓ $q=1$ (1)
6.2	Subs $(0;0)$ $0=\frac{a}{0+p}+1$ $\frac{a}{p}=-1$ $a=-p$ Subs P: $\sqrt{2}+1=\frac{a}{\sqrt{2}+2+p}+1$ $\sqrt{2}=\frac{a}{\sqrt{2}+2+p}$ $2+2\sqrt{2}+\sqrt{2}p=a$ $2+2\sqrt{2}=a-p\sqrt{2}=a+a\sqrt{2}$ $2\left(1+\sqrt{2}\right)=a\left(1+\sqrt{2}\right)$ $a=2$; $p=-2$ NOTE: Answer only 2 / 5	✓ $0=\frac{a}{0+p}+1$ ✓ $a=-p$ ✓ substitution ✓ $a=2$ ✓ $p=-2$ (5)
6.3		✓$y=1$ ✓$x=2$ ✓shape ✓(0 ; 0) (4) **[10]**

QUESTION/*VRAAG* 7

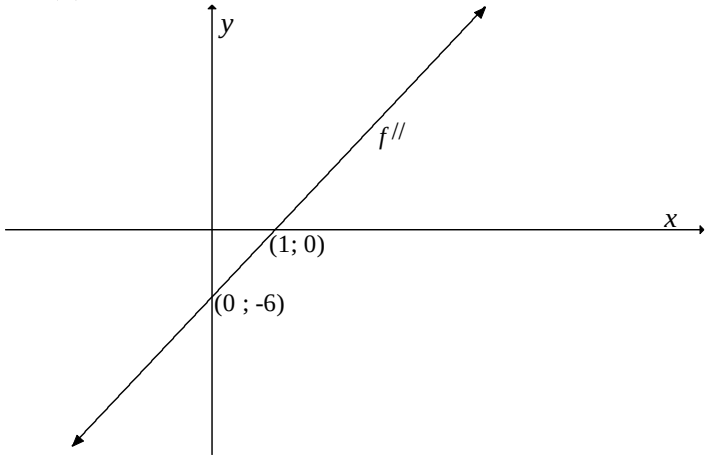
7.1	$F = \frac{x\left[(1+i)^n - 1\right]}{i}$ $= \frac{2500\left[\left(1+\frac{0,06}{12}\right)^{60} - 1\right]}{\frac{0,06}{12}}$ = R174 425,08	✓ n = 60 and $i = \frac{0,06}{12} / 0,005$ ✓ correct substitution into correct formula ✓ answer (3)
7.2.1	After eleven months, Genevieve will owe/ *Na elf maande skuld Genevieve* $A = 82\,000\left(1+\frac{0,15}{12}\right)^{11}$ = R 94 006,79	✓ n = 11 ✓ correct substitution into correct formula ✓ answer (3)
7.2.2	$P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $94\,006,79 = \frac{3\,200\left[1-\left(1+\frac{0,15}{12}\right)^{-n}\right]}{\frac{0,15}{12}}$ $\frac{94\,006,79}{3\,200} \times \frac{0,15}{12} = 1-\left(1+\frac{0,15}{12}\right)^{-n}$ $\left(1+\frac{0,15}{12}\right)^{-n} = 1-0,3672147...$ $-n\log\left(1+\frac{0,15}{12}\right) = \log 0,6327852...$ $-n = -36,8382...$ $n = 36,84$ Genevieve will have to pay 36 installments of R3 200	✓ 94 006,79 ✓ substitute into correct formula ✓ correct use of logs (logs to be defined) ✓ n =36,84 ✓ 36 installments (5)

7.2.3	$P = \frac{x\left[1-(1+i)^{-n}\right]}{i}$ $= \frac{3200\left[1-\left(1+\frac{0,15}{12}\right)^{-0,83826912}\right]}{\frac{0,15}{12}}$ $P = 2652$ Outstanding balance after 36 installments is R2 652 Final payment will be: $A = 2652,00\left(1+\frac{0,15}{12}\right)^{1}$ $= R\ 2685,00$ **OR/*OF*** Balance : $94006,79\left(1+\frac{0,15}{12}\right)^{36} - \frac{3200\left[\left(1+\frac{0,15}{12}\right)^{36}-1\right]}{\frac{0,15}{12}}$ $= R2\ 651,72$ Final payment will be: $A = 2651,72\left(1+\frac{0,15}{12}\right)^{1}$ $= R\ 2\ 685,00$	✓$n = -083826912$ ✓substitute into correct formula ✓answer ✓ $2652,00\left(1+\frac{0,15}{12}\right)^{1}$ ✓answer **OR/*OF*** ✓$94006,79\left(1+\frac{0,15}{12}\right)^{36}$ ✓$\frac{3200\left[\left(1+\frac{0,15}{12}\right)^{36}-1\right]}{\frac{0,15}{12}}$ ✓ 2 651,72 ✓ $2651,72\left(1+\frac{0,15}{12}\right)^{1}$ ✓answer (5) **[16]**

QUESTION/*VRAAG* 8

8.1	$f(x+h) = 4x^2$ $f(x+h) - f(x) = 4(x+h)^2 - 4x^2$ $= 4(x^2 + 2xh + h^2) - 4x^2$ $= 4x^2 + 8xh + 4h^2 - 4x^2$ $= 8xh + 4h^2$ $f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h\to 0}\left[\frac{8xh + 4h^2}{h}\right]$ $= \lim_{h\to 0}\left[\frac{h(8x + 4h)}{h}\right]$ $= 8x$ **OR/OF** $f'(x) = \lim_{h\to 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h\to 0}\left[\frac{4(x+h)^2 - 4x^2}{h}\right]$ $= \lim_{h\to 0}\left[\frac{4x^2 8xh + 4h^2 - 4x^2}{h}\right]$ $= \lim_{h\to 0}\left[\frac{8xh + 4h^2}{h}\right]$ $= \lim_{h\to 0}\left[\frac{h(8x + 4h)}{h}\right]$ $= 8x$	✓ $4(x+h)^2$ ✓ $8xh + 4h^2$ ✓ $\frac{f(x+h) - f(x)}{h}$ ✓ $\frac{h(8x + 4h)}{h}$ ✓ $8x$ **OR/OF** ✓ $\frac{f(x+h) - f(x)}{h}$ ✓ $4(x+h)^2$ ✓ $8xh + 4h^2$ ✓ $\frac{h(8x + 4h)}{h}$ ✓ $8x$ (5)
8.2.1	$D_x\left[\frac{x^2 - 2x - 3}{x-1}\right]$ $= D_x\left[\frac{(x-3)(x+1)}{x+1}\right]$ $= D_x(x-3)$ $= 1$	✓ $\frac{(x-3)(x+1)}{x+1}$ ✓ $(x-3)$ ✓ 1 (3)
8.2.2	$f(x) = \sqrt{x} = x^{\frac{1}{2}}$ $f'(x) = \frac{1}{2}x^{-\frac{1}{2}}$ $f''(x) = -\frac{1}{4}x^{-\frac{3}{2}}$	✓ $x^{\frac{1}{2}}$ ✓ $\frac{1}{2}x^{-\frac{1}{2}}$ ✓ $-\frac{1}{4}x^{-\frac{3}{2}}$ (3) **[11]**

QUESTION/*VRAAG* 9

9.1	$f(x)=(x+2)(x-1)(x-4)$ $=(x^2+x-2)(x-4)$ $=x^3+x^2-2x-4x^2-4x+8$ $=x^3-3x^2-6x+8$ $b=-3\ ;\ \ c=-6\ ;\ \ d=8$	✓✓ $f(x)=(x+2)(x-1)(x-4)$ ✓ expansion ✓ x^3-3x^2-6x+8 (4)
9.2	$f(x)=x^3-3x^2-6x+8$ $f'(x)=0$ $3x^2-6x-6=0$ $x^2-2x-2=0$ $x=\dfrac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\dfrac{2\pm\sqrt{(2)^2-4(1)(-2)}}{2(1)}$ $=\dfrac{2\pm\sqrt{12}}{2}$ $x=-0,73$	✓ $f'(x)=0$ ✓ $3x^2-6x-6$ ✓ substitution into correct formula ✓ $x=-0,73$ (4)
9.3	$f(x)=x^3-3x^2-6x+8$ $f(-1)=(-1)^3-3(-1)^2-6(-1)+8$ or $f(-1)=(1)(-2)(-5)$ $=10$ $=10$ $f'(-1)=3(-1)^2-6(-1)-6$ $=3$ $y-10=3(x+1)$ $y=3x+13$	✓ $f(-1)=10$ ✓ $f'(-1)=3$ ✓ substitution ✓ $y=3x+13$ (4)
9.4	$f''(x)=6x-6$  	✓ $f''(x)=6x-6$ ✓x- intercept ✓y- intercept (3)

9.5	f concave upwards $f''(x) > 0$ $6x - 6 > 0$ $x > 1$ NOTE: Answer only 2 / 2	✓ $f''(x) > 0$ ✓ $x > 1$ (2) **[17]**

QUESTION/*VRAAG* 10

	.	
	$f(x) = -3x^3 + x$	
	$-9x^2 + 1 = 0$	✓ $-9x^2 + 1 = 0$
	$x = \frac{1}{3}$ or $x = -\frac{1}{3}$	✓ $x = \frac{1}{3}$ *or* $x = -\frac{1}{3}$
	Maximum of f will be at $x = \frac{1}{3}$	✓ Maximum at $x = \frac{1}{3}$
	$f\left(\frac{1}{3}\right) = -3\left(\frac{1}{3}\right)^3 + \left(\frac{1}{3}\right)$ $= \frac{2}{9}$	✓ $f\left(\frac{1}{3}\right) = \frac{2}{9}$
	Maximum of $f(x) + q$ will also be at $x = \frac{1}{3}$	
	$f\left(\frac{1}{3}\right) + q = \frac{8}{9}$ $\frac{2}{9} + q = \frac{8}{9}$ $q = \frac{6}{9}$ $= \frac{2}{3}$	✓ $\frac{2}{9} + q = \frac{8}{9}$ ✓ $q = \frac{2}{3}$
	For $f(x) + q$ to have a maximum of $\frac{8}{9}$ the value of q has to be $\frac{2}{3}$.	**[6]**

QUESTION/*VRAAG* 11

11.1.1	Let the event Veli arrive late for school be V. Let the event Bongi arrive late for school be B. / *Laat V die gebeurtenis wees dat Veli Laat B die gebeurtenis wees dat Bongi laatkom* $P(V \text{ or } B) = 1 - 0,7$ $= 0,3$	✓ answer (1)
11.1.2	$P(V \text{ or } B) = P(V) + P(B) - P(V \text{ and } B)$ $0,3 = 0,25 + P(B) - 0,15$ $P(B) = 0,2$	✓ $P(V \text{ or } B) = P(V) + P(B) - P(V \text{ and } B)$ ✓substitution ✓ 0,2 (3)
11.1.3	$P(V) \times P(B) = 0,25 \times 0,2$ $= 0,05$ $P(V) \times P(B) \neq P(V \text{ and } B)$ V and B are NOT independent/ *V en B is NIE onafhanklik nie.*	✓ $P(V) \times P(B) = 0,05$ ✓ $P(V) \times P(B) \neq P(V \text{ and } B)$ ✓NOT independent (3)
11.2.1	$6! = 720$	✓ 6! or 720 (2)
11.2.2	Number of arrangements $= 3! \times 3! \times 2$ $= 72$	✓ $3! \times 3!$ ✓ $\times 2$ ✓ answer (3)
11.2.3	$P(\text{hearts next to each other}) = \frac{3! \times 4!}{6!}$ $= \frac{144}{720}$ $= \frac{1}{5}$ or 0,2 or 20% **OR/*OF*** $P(\text{hearts next to each other}) = \frac{4 \times 3! \times 3!}{6!}$ $= \frac{144}{720}$ $= \frac{1}{5}$ or 0,2 or 20%	✓ ✓ $3! \times 4!$ ✓ $\frac{1}{5}$ or 0,2 or 20% **OR/*OF*** ✓ ✓ ✓ $\frac{1}{5}$ or 0,2 or 20% (3) **[15]**

TOTAL/*TOTAAL*: 150