



basic education

Department:
Basic Education
REPUBLIC OF SOUTH AFRICA

SENIORSERTIKAAT-EKSAMEN/ NASIONALE SENIORSERTIFIKAAT-EKSAMEN

WISKUNDE V1

2022

PUNTE: 150

TYD: 3 uur

Hierdie vraestel bestaan uit 9 bladsye en 1 inligtingsblad.

INSTRUKSIES EN INLIGTING

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

1. Hierdie vraestel bestaan uit 10 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 11.1 Los op vir x :

1.1.1 $x^2 + 2x - 15 = 0$ (3)

1.1.2 $5x^2 - x - 9 = 0$ (Los jou antwoord korrek tot TWEE desimale syfers.) (3)

1.1.3 $x^2 \leq 3x$ (4)

1.2 Gegee: $a + \frac{64}{a} = 16$ 1.2.1 Los op vir a . (3)1.2.2 Los vervolgens op vir x : $2^x + 2^{6-x} = 16$ (3)1.3 **Sonder die gebruik van 'n sakrekenaar**, bereken die waarde van $\sqrt{\frac{2^{1002} + 2^{1006}}{17(2)^{998}}}$ (4)1.4 Los gelyktydig vir x en y op:

$$2x - y = 2 \quad \text{en} \quad \frac{1}{x} - 3y = 1$$
 (6)
[26]

VRAAG 22.1 Die eerste term van 'n rekenkundige ry is -1 en die 7^{de} term is 35 .

Bepaal:

2.1.1 Die gemeenskaplike verskil van die ry (2)

2.1.2 Die aantal terme in die ry indien die laaste term van die ry 473 is (3)2.1.3 Die som van die eerste 40 terme in die ry (2)2.2 $75 ; 53 ; 35 ; 21 ; \dots$ is 'n kwadratiese getalpatroon.

2.2.1 Skryf die VYFDE term van die getalpatroon neer. (1)

2.2.2 Bepaal die n^{de} term van die getalpatroon. (4)

2.2.3 Bepaal die maksimum waarde van die volgende getalpatroon:

$$-15 ; -\frac{53}{5} ; -7 ; -\frac{21}{5} ; \dots$$
 (4)
[16]

VRAAG 3

3.1 Beskou die volgende meetkundige ry: 1 024 ; 256 ; 64 ; ...

Bereken:

3.1.1 Die 10^{de} term van die ry (2)

3.1.2 $\sum_{p=0}^8 256(4^{1-p})$ (4)

3.2 Die eerste twee terme van 'n meetkundige ry is:

$$-t^2 - 6t - 9 \text{ en } \frac{t^3 + 9t^2 + 27t + 27}{2}$$

Bepaal die waardes van t waarvoor die ry sal konvergeer. (5)
[11]

VRAAG 4

Die grafiek van $g(x) = a\left(\frac{1}{3}\right)^x + 7$ gaan deur punt $E(-2 ; 10)$.

4.1 Bereken die waarde van a . (3)

4.2 Bereken die koördinate van die y -afsnit van g . (2)

4.3 Beskou: $h(x) = \left(\frac{1}{3}\right)^x$

4.3.1 Beskryf die translasië van g na h . (2)

4.3.2 Bepaal die vergelyking van die inverse van h , in die vorm $y = \dots$ (2)
[9]

VRAAG 5

Beskou: $g(x) = \frac{a}{x+p} + q$

Die volgende inligting van g word gegee:

- Definisieversameling: $x \in \mathbb{R}; x \neq -2$
- x - afsnit by $K(1; 0)$
- y - afsnit by $N\left(0; -\frac{1}{2}\right)$

- 5.1 Toon dat die vergelyking van g gegee word deur: $g(x) = \frac{-3}{x+2} + 1$ (6)
- 5.2 Skryf die waardeversameling van g neer. (1)
- 5.3 Bepaal die vergelyking van h , die simmetrie-as van g , in die vorm $y = mx + c$, waar $m > 0$. (3)
- 5.4 Skryf die koördinate van K' , die beeld van K gereflekteer oor h , neer. (2)

[12]

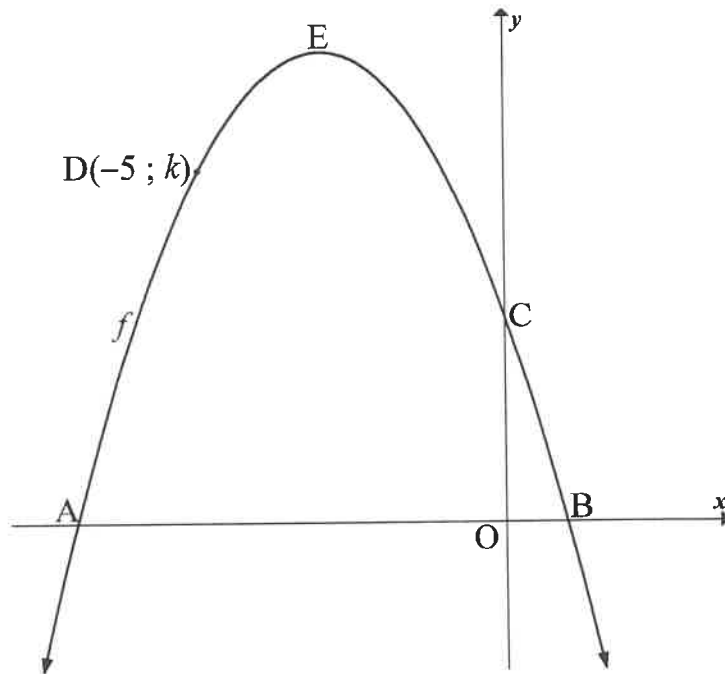
VRAAG 6

Die skets hieronder toon die grafiek van $f(x) = -x^2 - 6x + 7$.

C is die y -afsnit van f .

A en B is die x -afsnitte van f .

$D(-5; k)$ is 'n punt op f .



- 6.1 Bereken die koördinate van E, die draaipunt van f . (3)
- 6.2 Skryf die waarde van k neer. (1)
- 6.3 Bepaal die vergelyking van die reguitlyn wat deur C en D gaan. (4)
- 6.4 'n Raaklyn, ewewydig aan CD, raak f by P. Bepaal die koördinate van P. (4)
- 6.5 Vir watter waardes van x sal $f(x) - 12 > 0$? (2)
- [14]**

VRAAG 7

- 7.1 Hoeveel jaar sal dit 'n belegging neem om in waarde te verdubbel indien die belegging rente verdien teen 'n koers van 8,5% p.j., kwartaalliks saamgestel? (4)
- 7.2 'n Maatskappy het masjinerie vir R500 000 gekoop. Na 5 jaar is die masjinerie vir R180 000 verkoop en nuwe masjinerie is gekoop.
- 7.2.1 Bereken die waardeverminderingskoers van die ou masjinerie oor die 5 jaar, deur die verminderdesaldo-metode te gebruik. (4)
- 7.2.2 Die inflasiekoers vir die koste van die nuwe masjinerie is 6,3% p.j. oor die 5 jaar. Wat sal die nuwe masjinerie aan die einde van 5 jaar kos? (2)
- 7.2.3 Die maatskappy het 'n delgingsfonds begin en die eerste inbetaling in hierdie fonds gemaak op die dag toe die ou masjinerie gekoop is. Die laaste inbetaling is gemaak drie maande voordat die nuwe masjinerie aan die einde van die 5 jaar aangekoop is. Die rente verdien op die delgingsfonds was 10,25% p.j., maandeliks saamgestel. Die geld in die delgingsfonds en die R180 000 uit die verkoop van die ou masjinerie is gebruik om vir die nuwe masjinerie te betaal.
- Bereken die maandelikse inbetaling in die delgingsfonds. (5)
[15]

VRAAG 8

- 8.1 Bepaal $f'(x)$ vanuit eerste beginsels indien dit gegee word dat $f(x) = -x^2$. (5)
- 8.2 Bepaal:
- 8.2.1 $f'(x)$, indien dit gegee word dat $f(x) = 4x^3 - 5x^2$ (2)
- 8.2.2 $D_x \left[\frac{-6\sqrt[3]{x} + 2}{x^4} \right]$ (4)
[11]

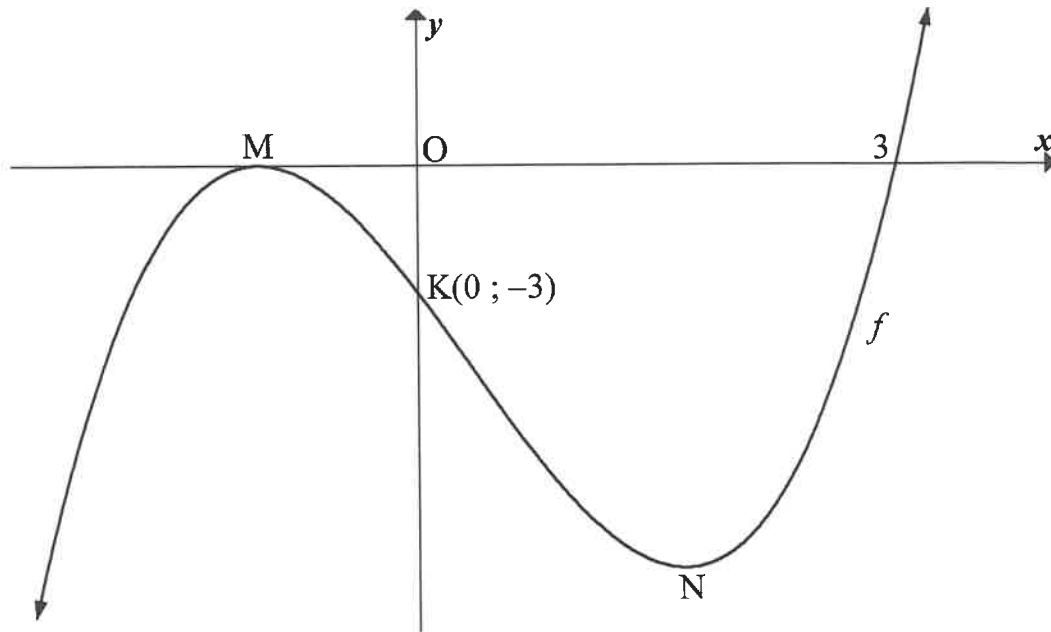
VRAAG 9

Die grafiek van $f(x) = x^3 + ax^2 + bx + c$ is hieronder geskets.

Die x -afsnitte van f is by $(3; 0)$ en M , waar M op die negatiewe x -as lê.

$K(0; -3)$ is die y -afsnit van f .

M en N is die draaipunte van f .



- 9.1 Toon dat die vergelyking van f gegee word deur $f(x) = x^3 - x^2 - 5x - 3$. (5)
- 9.2 Bereken die koördinate van N . (5)
- 9.3 Vir watter waardes van x sal:
- 9.3.1 $f(x) < 0$ (2)
- 9.3.2 f stygend wees (2)
- 9.3.3 f konkaf op wees (3)
- 9.4 Bepaal die maksimum vertikale afstand tussen die grafieke van f en f' in die interval $-1 < x < 0$. (6)
- [23]**

VRAAG 10

10.1 Vlae van vier Afrika-lande en drie Europese lande is tydens die 2021 Olimpiese Spele in 'n ry vertoon.

Bepaal:

10.1.1 Die totale getal maniere waarop al 7 vlae van hierdie lande vertoon kan word (2)

10.1.2 Die waarskynlikheid dat die vlae van die Afrika-lande langs mekaar vertoon is (3)

10.2 A en B is twee onafhanklike gebeurtenisse.

$$P(A) = 0,4 \text{ en } P(A \text{ of } B) = 0,88$$

Bereken $P(B)$. (3)

10.3 Daar is 120 passasiers aan boord van 'n vliegtuig. Passasiers het 'n keuse tussen 'n vleistoebroodjie of 'n kaastoebroodjie, maar meer passasiers sal 'n vleistoebroodjie kies. Daar is slegs 120 toebroodjies beskikbaar om uit te kies. Die waarskynlikheid dat die eerste passasier 'n vleistoebroodjie sal kies en die tweede passasier 'n kaastoebroodjie, is $\frac{18}{85}$. Bereken die waarskynlikheid dat die eerste passasier 'n kaastoebroodjie sal kies. (5)

[13]

TOTAAL: 150

INLIGTINGSBLAD

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

$$A = P(1 + ni)$$

$$A = P(1 - ni)$$

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

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

$$T_n = a + (n-1)d$$

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

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(r^n - 1)}{r - 1}; r \neq 1$$

$$S_\infty = \frac{a}{1 - r}; -1 < r < 1$$

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

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

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

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan \theta$$

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

$$\text{In } \Delta ABC: \frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$$

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

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

$$\sin(\alpha + \beta) = \sin \alpha \cdot \cos \beta + \cos \alpha \cdot \sin \beta$$

$$\sin(\alpha - \beta) = \sin \alpha \cdot \cos \beta - \cos \alpha \cdot \sin \beta$$

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

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

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

$$\sin 2\alpha = 2 \sin \alpha \cdot \cos \alpha$$

$$\bar{x} = \frac{\sum x}{n}$$

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

$$P(A) = \frac{n(A)}{n(S)}$$

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

$$\hat{y} = a + bx$$

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



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**SENIOR CERTIFICATE EXAMINATIONS/
SENIORSERTIFIKAAT-EKSAMEN
NATIONAL SENIOR CERTIFICATE EXAMINATIONS/
NASIONALE SENIORSERTIFIKAAT-EKSAMEN**

MATHEMATICS P1/WISKUNDE VI

MARKING GUIDELINES/NASIENRIGLYNE

2022

**MARKS: 150
PUNTE: 150**

**These marking guidelines consist of 16 pages.
*Hierdie nasienriglyne bestaan uit 16 bladsye.***

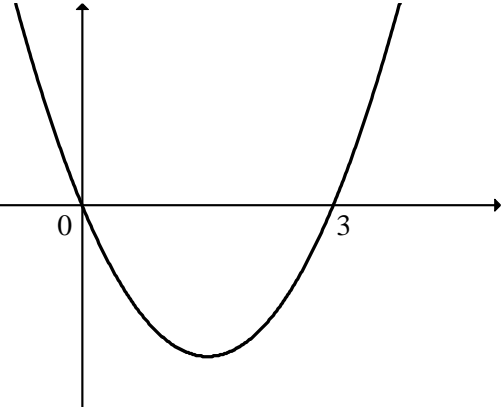
NOTE:

- 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 DEURGAANS op ALLE aspekte van die nasienriglyne van toepassing.

QUESTION/VRAAG 1

1.1.1	$x^2 + 2x - 15 = 0$ $(x + 5)(x - 3) = 0$ $x = -5 \text{ or } x = 3$	✓ factors ✓ $x = -5$ ✓ $x = 3$ (3)
1.1.2	$5x^2 - x - 9 = 0$ $x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(5)(-9)}}{2(5)}$ $x = \frac{1 \pm \sqrt{181}}{10}$ $x = 1,45 \text{ or } x = -1,25$	✓ substitution into the correct formula ✓ $x = 1,45$ ✓ $x = -1,25$ (3)
1.1.3	$x^2 \leq 3x$ $x^2 - 3x \leq 0$ $x(x - 3) \leq 0$  $0 \leq x \leq 3 \text{ OR } x \in [0;3]$	✓ standard form ✓ factors ✓✓ answer (4)
1.2.1	$a + \frac{64}{a} = 16$ $a^2 - 16a + 64 = 0$ $(a - 8)^2 = 0$ $a = 8$	✓ standard form ✓ factors ✓ answer (3)

<p>1.2.2</p>	$2^x + 2^{6-x} = 16$ $2^x + \frac{64}{2^x} = 16$ $2^x = 8 \text{ (from 1.2.1)}$ $2^x = 2^3$ $x = 3$	<p>✓ exp law</p> <p>✓ $2^x = 8$</p> <p>✓ answer (3)</p>
<p>1.3</p>	$\sqrt{\frac{2^{1002}(1+2^4)}{17(2)^{998}}}$ $= \sqrt{\frac{2^4(17)}{17}}$ $= \sqrt{2^4}$ $= 2^2$ $= 4$	<p>✓ common factor</p> <p>✓ second factor</p> <p>✓ simplification</p> <p>✓ answer (4)</p>
<p>1.4</p>	$2x - y = 2 \quad \dots(1)$ $\frac{1}{x} - 3y = 1 \quad \dots(2)$ $y = 2x - 2$ $\frac{1}{x} - 3(2x - 2) = 1$ $\frac{1}{x} - 6x + 6 - 1 = 0$ $1 - 6x^2 + 6x - x = 0$ $-6x^2 + 5x + 1 = 0$ $6x^2 - 5x - 1 = 0$ $(6x + 1)(x - 1) = 0$ $x = -\frac{1}{6} \text{ or } x = 1$ $y = 2\left(-\frac{1}{6}\right) - 2 \text{ or } y = 2(1) - 2$ $y = -\frac{7}{3} \text{ or } y = 0$	<p>✓ $y = 2x - 2$</p> <p>✓ substitution</p> <p>✓ simplification</p> <p>✓ standard form</p> <p>✓ x-values</p> <p>✓ y-values (6)</p>

OR/OF

$$x = \frac{2+y}{2} \dots(1)$$

$$\frac{1}{x} - 3y = 1 \dots(2)$$

$$\frac{1}{\frac{2+y}{2}} - 3y = 1$$

$$\frac{2}{2+y} - 3y = 1$$

$$\frac{2 - 6y - 3y^2}{2+y} = 1$$

$$2 - 6y - 3y^2 = 2 + y$$

$$-3y^2 - 7y = 0$$

$$-y(3y + 7) = 0$$

$$y = 0 \quad \text{or} \quad y = -\frac{7}{3}$$

$$x = 1 \quad \text{or} \quad x = -\frac{1}{6}$$

OR/OF

$$\checkmark x = \frac{2+y}{2}$$

✓ substitution

✓ simplification

✓ standard form

✓ y-values

✓ x-values

(6)
[26]

QUESTION/VRAAG 2

<p>2.1.1</p>	$a + 6d = 35$ $-1 + 6d = 35$ $6d = 36$ $d = 6$ <p>OR/OF</p> $\frac{35 - (-1)}{7 - 1} = 6$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>ANSWER ONLY: FULL MARKS</p> </div>	<p>✓ substitution</p> <p>✓ answer (2)</p> <p>OR/OF</p> <p>✓ substitution</p> <p>✓ answer (2)</p>
<p>2.1.2</p>	$T_n = a + (n - 1)d$ $473 = -1 + (n - 1)(6)$ $79 = n - 1$ $\therefore n = 80$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>ANSWER ONLY: FULL MARKS</p> </div>	<p>✓ substitution into the correct formula</p> <p>✓ equating to 473</p> <p>✓ answer (3)</p>
<p>2.1.3</p>	$S_n = \frac{n}{2}[2a + (n - 1)d]$ $S_{40} = \frac{40}{2}[2(-1) + (40 - 1)(6)]$ $\therefore S_{40} = 4640$ <p>OR/OF</p> $T_{40} = 6(40) - 7$ $= 233$ $S_n = \frac{n}{2}(a + l)$ $= \frac{40}{2}(-1 + 233)$ $= 4640$	<p>✓ substitution</p> <p>✓ answer (2)</p> <p>OR/OF</p> <p>✓ substitution</p> <p>✓ answer (2)</p>
<p>2.2.1</p>	$ \begin{array}{ccccccc} 75 & & 53 & & 35 & & 21 \\ & \backslash & / & \backslash & / & \backslash & / \\ & -22 & & -18 & & -14 & \\ & & \backslash & / & \backslash & / & \\ & & 4 & & 4 & & \end{array} $ $T_5 = 11$	<p>✓ answer (A) (1)</p>
<p>2.2.2</p>	$T_n = an^2 + bn + c$ $2a = 4$ $a = 2$ $3a + b = -22$ $6 + b = -22$ $b = -28$ $a + b + c = 75$ $2 - 28 + c = 75$ $c = 101$ $\therefore T_n = 2n^2 - 28n + 101$	<p>✓ $T_n = an^2 + bn + c$</p> <p>✓ $a = 2$</p> <p>✓ $b = -28$</p> <p>✓ $c = 101$ (4)</p>

2.2.3

Minimum value of T_n

$$n = -\frac{b}{2a} = -\frac{(-28)}{2(2)}$$

$$n = 7$$

✓ $n = 7$

Minimum value of $T_n = 2(7)^2 - 28(7) + 101 = 3$

✓ min value = 3

Each term in the new pattern is $-\frac{1}{5}$ the value of the terms in the old pattern.

✓ $-\frac{1}{5}$ value of term of old pattern

Maximum value of new pattern = $-\frac{3}{5}$

✓ max value = $-\frac{3}{5}$ (4)

OR/OF

$$T'_n = 4n - 28$$

$$4n - 28 = 0$$

$$4n = 28$$

$$n = 7$$

OR/OF

✓ $n = 7$

Minimum value of $T_n = 2(7)^2 - 28(7) + 101 = 3$

✓ min value = 3

Each term in the new pattern is $-\frac{1}{5}$ the value of the terms in the old pattern.

✓ $-\frac{1}{5}$ value of term of old pattern

Maximum value of new pattern = $-\frac{3}{5}$

✓ max value = $-\frac{3}{5}$ (4)

OR/OF

$$T_n = -\frac{2}{5}n^2 + \frac{28}{5}n - \frac{101}{5}$$

OR/OF

✓✓ $T_n \div (-5)$

$$n = -\frac{b}{2a} = \frac{-\frac{28}{5}}{2\left(\frac{-2}{5}\right)}$$

$$= 7$$

✓ $n = 7$

$$T_7 = -\frac{3}{5}$$

✓ max value = $-\frac{3}{5}$ (4)

OR/OF

OR/OF

$$T_n = -\frac{2}{5}n^2 + \frac{28}{5}n - \frac{101}{5}$$

$$T'_n = -\frac{4}{5}n + \frac{28}{5}$$

$$\checkmark\checkmark T_n \div (-5)$$

$$-\frac{4}{5}n + \frac{28}{5} = 0$$

$$-4n = -28$$

$$n = 7$$

$$\text{Minimum value of } T_n = 2(7)^2 - 28(7) + 101 = 3$$

Each term in the new pattern is $-\frac{1}{5}$ the value of the terms in the old pattern.

$$\checkmark n = 7$$

$$\text{Maximum value of new pattern} = -\frac{3}{5}$$

$$\checkmark \text{max value} = -\frac{3}{5}$$

(4)

[16]

QUESTION/VRAAG 3

<p>3.1.1</p>	$T_n = ar^{n-1}$ $T_{10} = 1024 \left(\frac{1}{4}\right)^{10-1}$ $\therefore T_{10} = \frac{1}{256}$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p style="text-align: center;">ANSWER ONLY: FULL MARKS</p> </div>	<p>✓ substitution into the correct formula</p> <p>✓ answer</p> <p style="text-align: right;">(2)</p>
<p>3.1.2</p>	$\sum_{p=0}^8 256(4^{1-p}) = 1024 + 256 + 64 + \dots$ $S_n = \frac{a[1-r^n]}{1-r}$ $S_9 = \frac{1024 \left[1 - \left(\frac{1}{4}\right)^9\right]}{1 - \frac{1}{4}}$ $S_9 = \frac{87381}{64}$ $= 1365,33$ <p>OR/OF</p> $\sum_{p=0}^8 256(4^{1-p})$ $= 1024 + 256 + 64 + 16 + 4 + 1 + \frac{1}{4} + \frac{1}{16} + \frac{1}{64}$ $S_9 = \frac{87381}{64}$ $= 1365,33$	<p>✓ 1024</p> <p>✓ $n = 9$</p> <p>✓ substitution into the correct formula</p> <p>✓ answer</p> <p style="text-align: right;">(4)</p> <p>OR/OF</p> <p>✓ 1024</p> <p>✓ rest of expansion</p> <p>✓ $n = 9$ terms</p> <p>✓ answer</p> <p style="text-align: right;">(4)</p>
<p>3.2</p>	$-t^2 - 6t - 9; \frac{t^3 + 9t^2 + 27t + 27}{2}$ $-(t^2 + 6t + 9); \frac{1}{2}(t+3)(t^2 + 6t + 9)$ $-(t+3)^2; \frac{1}{2}(t+3)^3$ $r = \frac{-(t+3)}{2}$ $-1 < \frac{-t-3}{2} < 1$ $-2 < -t-3 < 2$ $1 < -t < 5$ $-5 < t < -1$	$r = \frac{t^3 + 9t^2 + 27t + 27}{-t^2 - 6t - 9}$ <p>✓ $-(t^2 + 6t + 9)$</p> <p>✓ $\frac{1}{2}(t+3)(t^2 + 6t + 9)$</p> <p>✓ $-1 < \frac{-t-3}{2} < 1$</p> <p>✓ answer</p> <p style="text-align: right;">(5)</p>
		<p>[11]</p>

QUESTION 4

4.1	$10 = a\left(\frac{1}{3}\right)^{-2} + 7$ $3 = 9a$ $\therefore a = \frac{1}{3}$	✓ subs (-2 ; 10) ✓ simplification ✓ answer (3)
4.2	$y = g(0)$ $y = \frac{1}{3} \times \left(\frac{1}{3}\right)^0 + 7$ $y = \frac{22}{3} = 7,33$ $\therefore \left(0 ; \frac{22}{3}\right)$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> ANSWER ONLY: FULL MARKS </div>	✓ substitution of $x = 0$ ✓ answer (2)
4.3.1	Translation by 1 unit to the right and 7 units downwards	✓ 1 unit right ✓ 7 units downwards (2)
4.3.2	$h(x) = \left(\frac{1}{3}\right)^x$ $h^{-1}: x = \left(\frac{1}{3}\right)^y$ $y = \log_{\frac{1}{3}}(x) \quad \text{OR/OF} \quad y = -\log_3(x)$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> ANSWER ONLY: FULL MARKS </div>	✓ swap x and y ✓ answer (2)
		[9]

QUESTION 5

<p>5.1</p>	$g(x) = \frac{a}{x+2} + q$ <p>Subs (1 ; 0):</p> $0 = \frac{a}{1+2} + q$ $0 = a + 3q$ <p>Subs $\left(0 ; -\frac{1}{2}\right)$</p> $-\frac{1}{2} = \frac{a}{0+2} + q$ $-1 = a + 2q$ <p>Solving simultaneously:</p> $q = 1$ $a = -3$ $\therefore g(x) = \frac{-3}{x+2} + 1$	<p>✓ $g(x) = \frac{a}{x+2} + q$</p> <p>✓ $0 = a + 3q$</p> <p>✓ $-1 = a + 2q$</p> <p>✓ solving simultaneously</p> <p>✓ $q = 1$</p> <p>✓ $a = -3$</p> <p style="text-align: right;">(6)</p>
<p>5.2</p>	<p>$y \in \mathbb{R}; y \neq 1$</p> <p>OR/OF</p> <p>$(-\infty; 1)$ or $(1; \infty)$</p> <p>OR/OF</p> <p>$y < 1$ or $y > 1$</p>	<p>✓ answer</p> <p style="text-align: right;">(1)</p>
<p>5.3</p>	<p>$y - 1 = 1(x + 2)$ OR/OF</p> <div style="border: 1px solid black; padding: 5px; display: inline-block; margin: 5px;"> <p>ANSWER ONLY: FULL MARKS</p> </div> <p>$y = x + 3$</p>	<p>$1 = 1(-2) + c$</p> <p>$c = 3$</p> <p>$y = x + 3$</p> <p>✓ $m = 1$</p> <p>✓ subs point $(-2 ; 1)$</p> <p>✓ answer</p> <p style="text-align: right;">(3)</p>
<p>5.4</p>	<p>$K'(-3 ; 4)$</p>	<p>✓ x-value</p> <p>✓ y-value</p> <p style="text-align: right;">(2)</p>
		<p>[12]</p>

QUESTION 6

<p>6.1</p>	$f(x) = -x^2 - 6x + 7$ $f'(x) = -2x - 6$ $-2x - 6 = 0$ $x = -3$ $E(-3 ; 16)$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>ANSWER ONLY: FULL MARKS</p> </div>	<p>✓ method</p> <p>✓ x-value</p> <p>✓ y-value</p> <p style="text-align: right;">(3)</p>
<p>6.2</p>	$k = f(-5)$ $k = -(-5)^2 - 6(-5) + 7$ $\therefore k = 12$	<p>✓ answer (A)</p> <p style="text-align: right;">(1)</p>
<p>6.3</p>	<p>C(0 ; 7)</p> <p>D(-5 ; 12)</p> $m_{CD} = \frac{12 - 7}{-5 - 0}$ $m_{CD} = -1$ <p>Equation of CD:</p> $y = -x + 7$	<p>✓ coordinates of C</p> <p>✓ substitution</p> <p>✓ m</p> <p>✓ answer</p> <p style="text-align: right;">(4)</p>
<p>6.4</p>	$-2x - 6 = -1$ $-2x = 5$ $x = -\frac{5}{2}$ $y = f\left(-\frac{5}{2}\right) = -\left(-\frac{5}{2}\right)^2 - 6\left(-\frac{5}{2}\right) + 7 = \frac{63}{4} = 15,75$ $\therefore P\left(-\frac{5}{2}; \frac{63}{4}\right)$	<p>✓ $f'(x) = -2x - 6$</p> <p>✓ equating to -1</p> <p>✓ x-value</p> <p>✓ y-value (A)</p> <p style="text-align: right;">(4)</p>
<p>6.5</p>	<p>Point by symmetry: (-1 ; 12)</p> $-5 < x < -1$ <p>OR/OF</p> $-x^2 - 6x + 7 > 12$ $-x^2 - 6x - 5 > 0$ $x^2 + 6x + 5 < 0$ $(x + 1)(x + 5) < 0$ $-5 < x < -1$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>ANSWER ONLY: FULL MARKS</p> </div>	<p>✓ -1</p> <p>✓ answer</p> <p style="text-align: right;">(2)</p> <p>✓ -1</p> <p>✓ answer</p> <p style="text-align: right;">(2)</p>
		<p>[14]</p>

QUESTION 7

<p>7.1</p>	$A = P(1 + i)^n$ $2 = 1 \left(1 + \frac{0,085}{4} \right)^{4n}$ $4n = \log_{\left(1 + \frac{0,085}{4} \right)} 2$ $n = 8,24 \text{ years}$	<p> $\checkmark 2$ } In $\checkmark \frac{0,085}{4}$ } correct formula \checkmark use of logs \checkmark answer in years (4) </p>
<p>7.2.1</p>	$A = P(1 - i)^n$ $180\ 000 = 500\ 000(1 - i)^5$ $\frac{9}{25} = (1 - i)^5$ $\sqrt[5]{\frac{9}{25}} = 1 - i$ $i = 0,1848068\dots$ $r = 18,48\%$	<p> \checkmark subs into correct formula \checkmark simplification $\checkmark i = 0,1848\dots$ \checkmark answer (4) </p>
<p>7.2.2</p>	$A = P(1 + i)^n$ $A = 500\ 000(1 + 0,063)^5$ $A = R678\ 635,11$	<p> \checkmark subs into correct formula \checkmark answer (2) </p>
<p>7.2.3</p>	<p>Sinking Fund = 678 635,11 – 180 000 = R 498 635,11</p> $498\ 635,11 = \frac{x \left[\left(1 + \frac{0,1025}{12} \right)^{58} - 1 \right] \left(1 + \frac{0,1025}{12} \right)^3}{\frac{0,1025}{12}}$ $x = R6\ 510,36$	<p> \checkmark value of sinking fund $\checkmark \frac{0,1025}{12}$ $\checkmark n = 58$ (A) $\checkmark \left(1 + \frac{0,1025}{12} \right)^3$ \checkmark answer (A) (5) </p>
		<p style="text-align: right;">[15]</p>

QUESTION/VRAAG 8

<p>8.1</p>	$f(x) = -x^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-(x+h)^2 + x^2}{h}$ $f'(x) = \lim_{h \rightarrow 0} \frac{-x^2 - 2xh - h^2 + x^2}{h}$ $= \lim_{h \rightarrow 0} \frac{-2xh - h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-2x - h)}{h}$ $= \lim_{h \rightarrow 0} (-2x - h)$ $\therefore f'(x) = -2x$ <p>OR/OF</p> $f(x) = -x^2$ $f(x+h) = -(x+h)^2 = -x^2 - 2xh - h^2$ $f(x+h) - f(x) = -x^2 - 2xh - h^2 - (-x^2) = -2xh - h^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{-2xh - h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-2x - h)}{h}$ $= \lim_{h \rightarrow 0} (-2x - h)$ $\therefore f'(x) = -2x$	<p>✓ substitution into formula</p> <p>✓ $-(x^2 + 2xh + h^2)$</p> <p>✓ $-2xh - h^2$</p> <p>✓ $-2x - h$</p> <p>✓ answer (5)</p> <p>OR/OF</p> <p>✓ $-x^2 - 2xh - h^2$</p> <p>✓ $-2xh - h^2$</p> <p>✓ substitution into the formula</p> <p>✓ $-2x - h$</p> <p>✓ answer (5)</p>
<p>8.2.1</p>	$f(x) = 4x^3 - 5x^2$ $f'(x) = 12x^2 - 10x$	<p>✓ $12x^2$ (A)</p> <p>✓ $-10x$ (A)</p> <p>(2)</p>
<p>8.2.2</p>	$D_x \left[\frac{-6\sqrt[3]{x} + 2}{x^4} \right]$ $= D_x \left[\frac{-6(x)^{\frac{1}{3}}}{x^4} + \frac{2}{x^4} \right]$ $= D_x \left[-6x^{-\frac{11}{3}} + 2x^{-4} \right]$ $= 22x^{-\frac{14}{3}} - 8x^{-5}$	<p>✓ $x^{\frac{1}{3}}$</p> <p>✓ $-6x^{-\frac{11}{3}} + 2x^{-4}$</p> <p>✓ $22x^{-\frac{14}{3}}$</p> <p>✓ $-8x^{-5}$</p> <p>(4)</p>
		<p>[11]</p>

QUESTION/VRAAG 9

<p>9.1</p>	$f(x) = (x+t)^2(x-3)$ $-3 = (0+t)^2(0-3)$ $1 = t^2$ $t = \pm 1$ $\therefore t = 1$ $f(x) = (x+1)^2(x-3)$ $f(x) = (x^2 + 2x + 1)(x-3)$ $f(x) = x^3 - x^2 - 5x - 3$	<p>✓ $f(x) = (x+t)^2(x-3)$ ✓ subs (0 ; -3)</p> <p>✓ t</p> <p>✓ $f(x) = (x+1)^2(x-3)$ ✓ expansion</p> <p style="text-align: right;">(5)</p>
<p>9.2</p>	$f'(x) = 3x^2 - 2x - 5$ $0 = 3x^2 - 2x - 5$ $0 = (x+1)(3x-5)$ $x = -1 \text{ or } x = \frac{5}{3}$ $N\left(\frac{5}{3}; -\frac{256}{27}\right) = (1,67; -9,48)$	<p>✓ $f'(x) = 3x^2 - 2x - 5$ ✓ = 0</p> <p>✓ factors ✓ x-value ($x > 0$)</p> <p>✓ y-value (A) (5)</p>
<p>9.3.1</p>	<p>$x < 3 ; x \neq -1$</p> <p>OR/OF $x < -1 \text{ or } -1 < x < 3$</p> <p>OR/OF $(-\infty; -1) \text{ or } (-1; 3)$</p>	<p>✓ $x < 3$ ✓ $x \neq -1$ (2)</p> <p>OR/OF ✓ $x < -1$ ✓ $-1 < x < 3$ (2)</p> <p>OR/OF ✓ $(-\infty; -1)$ ✓ $(-1; 3)$ (2)</p>
<p>9.3.2</p>	<p>$x < -1 \text{ or } x > \frac{5}{3}$ OR/OF $x \leq -1 \text{ or } x \geq \frac{5}{3}$</p> <p>OR/OF $(-\infty; -1) \text{ or } \left(\frac{5}{3}; \infty\right)$ OR/OF $(-\infty; -1] \text{ or } \left[\frac{5}{3}; \infty\right)$</p>	<p>✓ $x < -1$ ✓ $x > \frac{5}{3}$ (2)</p> <p>OR/OF ✓ $(-\infty; -1)$ ✓ $\left(\frac{5}{3}; \infty\right)$ (2)</p>
<p>9.3.3</p>	<p>$f''(x) > 0$ $6x - 2 > 0$ $x > \frac{1}{3} \text{ or } \left(\frac{1}{3}; \infty\right)$</p> <p>OR/OF $\frac{\frac{5}{3} + (-1)}{2} = \frac{1}{3}$ $x > \frac{1}{3} \text{ or } \left(\frac{1}{3}; \infty\right)$</p> <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p style="text-align: center;">ANSWER ONLY: FULL MARKS</p> </div>	<p>✓ $6x - 2$ ✓ $\frac{1}{3}$ ✓ $x > \frac{1}{3}$ (3)</p> <p>OR/OF ✓ substitution ✓ $\frac{1}{3}$ ✓ $x > \frac{1}{3}$ (3)</p>

9.4	$\text{Distance} = x^3 - x^2 - 5x - 3 - (3x^2 - 2x - 5)$ $= x^3 - 4x^2 - 3x + 2$ $\frac{d\text{Distance}}{dx} = 3x^2 - 8x - 3$ $0 = 3x^2 - 8x - 3$ $0 = (3x + 1)(x - 3)$ $x = 3 \text{ or } x = -\frac{1}{3}$ <p>Max distance</p> $= \left(-\frac{1}{3}\right)^3 - 4\left(-\frac{1}{3}\right)^2 - 3\left(-\frac{1}{3}\right) + 2$ $= \frac{68}{27} = 2,52$	$\checkmark x^3 - 4x^2 - 3x + 2$ $\checkmark \frac{d\text{Distance}}{dx} = 3x^2 - 8x - 3$ \checkmark factors \checkmark x-values $\checkmark x = -\frac{1}{3}$ \checkmark answer
		(6) [23]

QUESTION/VRAAG 10

10.1.1	$7! = 5\ 040$	✓✓ answer (2)
10.1.2	$4! \times 4!$ $= 576$ $P(\text{African flags together}) = \frac{576}{5040} \left(= \frac{4}{35} = 0,11 \right)$	✓ 4! ✓ $4! \times 4!$ ✓ answer (A) (3)
10.2	$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$ $0,88 = 0,4 + P(B) - P(A \text{ and } B)$ $0,88 = 0,4 + P(B) - 0,4P(B)$ $0,48 = 0,6P(B)$ $P(B) = 0,8$	✓ subs into rule ✓ $P(A \text{ and } B) = 0,4P(B)$ ✓ answer (3)
10.3	<p style="text-align: center;"> First Passenger Second Passenger </p> <div style="text-align: center;"> </div> <p> Probability of first passenger choosing meat = $\frac{x}{120}$ Probability of second passenger choosing cheese = $\frac{120-x}{119}$ $\frac{x}{120} \times \frac{120-x}{119} = \frac{18}{85}$ $120x - x^2 = 3\ 024$ $x^2 - 120x + 3\ 024 = 0$ $(x - 84)(x - 36) = 0$ $x = 84 \text{ or } x = 36$ $\therefore P(\text{1st cheese}) = \frac{36}{120} = \frac{3}{10}$ </p>	✓ $\frac{x}{120}$ ✓ $\frac{120-x}{119}$ ✓ $\frac{x}{120} \times \frac{120-x}{119} = \frac{18}{85}$ ✓ $x = 84 \text{ or } x = 36$ ✓ $\frac{3}{10}$ (5)
		[13]

TOTAL/TOTAAL: 150