Province of the
EASTERN CAPE
EDUCATION

sit/file

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIORSERTIFIKAAT*

GRADE/*GRAAD 12*

SEPTEMBER 2023

MATHEMATICS P1/*WISKUNDE V1* MARKING GUIDELINE/*NASIENRIGLYN*

MARKS/*PUNTE:* **150**

This marking guideline consists of 17 pages./
Hierdie nasienriglyn bestaan uit 17 bladsye.

NOTE/*LET WEL*:

- If a candidate answers a question TWICE, mark the FIRST attempt ONLY.
  Indien 'n kandidaat 'n vraag TWEE keer beantwoord, merk SLEGS die EERSTE poging.
- Consistent accuracy applies in ALL aspects of the marking guideline.
  Volgehoue akkuraatheid geld deurgaans in ALLE aspekte van die nasienriglyn.
- If a candidate crossed out an attempt of a question and did not redo the question, mark the crossed-out attempt.
  Indien 'n kandidaat 'n poging vir 'n vraag deurgetrek het en nie die vraag weer beantwoord het nie, merk die poging wat deurgetrek is.
- The mark for substitution is awarded for substitution into the correct formula.
  Die punt vir substitusie word toegeken vir substitusie in die korrekte formule.

QUESTION 1/*VRAAG 1*

1.1.1	$x^2+x-30=0$ $(x-5)(x+6)=0$ ✓ $\therefore x=5$ or / *of* $x=-6$ ✓ ✓ **OR/*OF*** $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\frac{-1\pm\sqrt{(1)^2-4(1)(-30)}}{2(1)}$ $=\frac{-1\pm\sqrt{121}}{2}$ $=5$ or / *of* -6	✓ factors / *faktore* ✓ $x=5$ ✓ $x=-6$ **OR/*OF*** ✓ substitution / *vervanging* ✓ $x=5$ ✓ $x=-6$ (3)
1.1.2	$x(2x-6)=-3$ $2x^2-6x+3=0$ ✓ $x=\frac{-b\pm\sqrt{b^2-4ac}}{2a}$ $=\frac{-(-6)\pm\sqrt{(-6)^2-4(2)(3)}}{2(2)}$ ✓ $=\frac{6\pm\sqrt{12}}{4}$ $=2{,}37$ or / *of* $0{,}63$ ✓ ✓	✓ standard form / *standaardvorm* ✓ substitution / *vervanging* ✓ $x=2{,}37$ or/*of* ✓ $x=0{,}63$ (4)
1.1.3	$x^2-2x+1>0$ $(x-1)(x-1)>0$ ✓ $c/v: x=1$ $\therefore x\in\mathbb{R}, x\neq 1$ A ✓✓ NOT: $x<1<x$ ///	+ 0 + (1) $x<1$ or $1<x$ ✓ factors / *faktore* ✓✓ $x\in\mathbb{R}, x\neq 1$ (Accuracy/*Akkuraatheid*) (3)

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1.1.4	$2x-1=\sqrt{4-5x}$ $(2x-1)^2=\left(\sqrt{4-5x}\right)^2$ ✓ $(2x-1)^2=4-5x$ $4x^2-4x+1+5x-4=0$ $4x^2+x-3=0$ ✓ $(4x-3)(x+1)=0$ ✓ or / *of* $x=\frac{-1\pm\sqrt{(1)^2-4(4)(-3)}}{2(4)}$ $\therefore x=\frac{3}{4}$ or / *of* $x\neq -1$ ✓	✓ squaring both sides *kwadreer beide kante* ✓ standard form / *standaardvorm* ✓ factors / *formula* *faktore / formule* ✓ answers with selection *antwoorde met seleksie/keuse* (4)
1.2	$y-2x=-1$.....(1) $y^2+2xy=3x^2$.....(2) $y=2x-1$.....(3) ✓ Substitute / *Vervang* (3) into/*in* (2): $(2x-1)^2+2x(2x-1)-3x^2=0$ ✓ $4x^2-4x+1+4x^2-2x-3x^2=0$ $5x^2-6x+1=0$ ✓ $(5x-1)(x-1)=0$ ✓ $\therefore x=\frac{1}{5}$ or / *of* $x=1$ ✓ $\therefore y=-\frac{3}{5}$ or / *of* $y=1$ ✓ **OR/*OF*** $y-2x=-1$.....(1) $y^2+2xy=3x^2$.....(2) $x=\frac{y+1}{2}$.....(3) Substitute / *Vervang* (3) into / *in* (2) $y^2+2y\left(\frac{y+1}{2}\right)-3\left(\frac{y+1}{2}\right)^2=0$ $y^2+y^2+y-3\left(\frac{y^2+2y+1}{4}\right)=0$ $8y^2+4y-3y^2-6y-3=0$ $5y^2-2y-3=0$ $(5y+3)(y-1)=0$ $\therefore y=-\frac{3}{5}$ or / *of* $y=1$ $\therefore x=\frac{1}{5}$ or / *of* $x=1$	✓ $y=2x-1$ ✓ substitution / *vervanging* ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ *x*-values / *x-waardes* ✓ *y*-values / *y-waardes* (6) **OR/*OF*** ✓ $x=\frac{y+1}{2}$ ✓ substitution / *vervanging* ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ *y*-values / *y-waardes* ✓ *x*-values / *x-waardes* (6)

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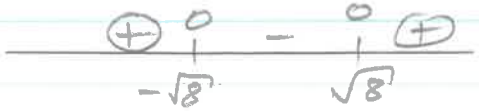
1.3. $2x^2 - px + 1 = 0$

$\Delta = b^2 - 4ac$
$= (-p)^2 - 4(2)(1)$
$= p^2 - 8$ ✓

For unequal roots

$\Delta > 0$ ✓
$p^2 - 8 > 0$ ✓
$(p - \sqrt{8})(p + \sqrt{8}) > 0$



(5)

$p < -\sqrt{8}$ or $\sqrt{8} < p$

$\therefore$ $p < -2,83$ or $2,83 < p$ ✓✓

1.3 PTO	$2x^2 - px + 1 = 0$ For real unequal roots: *Vir ongelykereële wortels* : $b^2 - 4ac > 0$ $(-p)^2 - 4(2)(1) > 0$ $p^2 - 8 > 0$ $\therefore p < -\sqrt{8}$ *or / of* $p > -\sqrt{8}$	✓ $b^2 - 4ac > 0$ ✓ substitution / *vervanging* ✓ standard form / *standaardvorm* ✓✓ answer / *antwoord* (5)
		[25]

QUESTION 2/*VRAAG 2*

2.1.1	✓ $a + 9d = 21$ T_{10} ✓ $a + 16d = 49$ T_{17} $\therefore -7d = -28$ $d = 4$ ✓ (3)	✓ $a + 9d = 21$ ✓ $a + 16d = 49$ ✓ value of d / *waarde van d* (3)
2.1.2	$a + 9(4) = 21$ $a = -15$ ✓ $T_{18} = T_{17} + 4$ $= 49 + 4$ $= 53$ ✓ (3) $\therefore T_1 + T_{18}$ $= -15 + 53$ $= 38$ ✓	✓ $a = -15$ ✓ $T_{18} = 53$ ✓ answer / *antwoord* (3)
2.2.1	$T_1 = 4(1) - 19 = -15$ $T_2 = 4(2) - 19 = -11$ ✓ (1) $T_3 = 4(3) - 19 = -7$	✓ all three terms / *al drie terme* (1)
2.2.2	$S_n = \frac{n}{2}[2a + (n-1)d]$ $S_m = \frac{m}{2}[2(-15) + 4(m-1)]$ $1189 = \frac{m}{2}(-30 + 4m - 4)$ ✓ $0 = 2m^2 - 17m - 1189$ ✓ $(2m + 41)(m - 29) = 0$ ✓ or / *of* (4) $m = \frac{-(-17) \pm \sqrt{(-17)^2 - 4(2)(-1189)}}{2(2)}$ $\therefore m = 29$ or / *of* $m \neq -\frac{41}{2}$ ✓	✓ substitution / *vervanging* and/en = 1 189 ✓ standard form / *standaardvorm* ✓ method / *metode* ✓ answer / *antwoord* (4)

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2.3.1	−78 −76 −72 −66 2 4 6 2 2 $-58\ ;-48$ ✓	✓ both answers / *beide antwoorde* (1)
2.3.2	$T_n = an^2 + bn + c$ $2a = 2 \quad 3a+b=2 \quad a+b+c=-78$ $a=1$ ✓ $3(1)+b=2 \quad 1-1+c=-78$ $b=-1$ ✓ $c=-78$ ✓ $\therefore T_n = n^2 - n - 78$ ✓	✓ $a=1$ ✓ $b=-1$ ✓ $c=-78$ ✓ answer / *antwoord* (4)
2.3.3 PTO	$k > 78$ ✓✓ (Accept/*Aanvaar* $k \geq 78$)	✓✓ answer / *antwoord* (2)
		[18]

QUESTION 3/*VRAAG 3*

3.1	$a = 81$ .....(1) ✓ $a + ar^2 = 117$ .....(2) $a(1+r^2) = 117$ $81(1+r^2) = 117$ ✓ $1+r^2 = \frac{117}{81}$ $r^2 = \frac{36}{81}$ ✓ $r = \pm\frac{2}{3}$ ✓	✓ $a + ar^2 = 117$ ✓ substitution / *vervanging* ✓ simplification / *vereenvoudiging* ✓ answer / *antwoord* (4)
3.2.1	$r = \frac{9^x}{3^x}$ $= \frac{3^{2x}}{3^x}$ $= 3^x$ ✓	✓ answer / *antwoord* (1) ~~(3)~~

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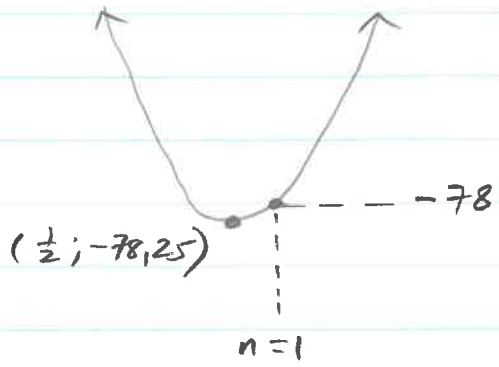
2.3.3. $T_n = n^2 - n - 78$

"x" $= -\frac{b}{2a}$

$= -\frac{(-1)}{2(1)}$

$= \frac{1}{2}$



"y" $= \left(\frac{1}{2}\right)^2 - \left(\frac{1}{2}\right) - 78$

$= -78,25$

$T_1 = -78$

$\therefore \quad k > 78$

3.2.2	$S_\infty = \frac{a}{1-r}$ $a = 3^x$ $r = 3^x$ ✓ $\frac{1}{2} = \frac{3^x}{1-3^x}$ ✓ $2.3^x = 1-3^x$ $3.3^x = 1$ $3^x = \frac{1}{3}$ $3^x = 3^{-1}$ $\therefore x = -1$ ✓	✓ $a = 3^x$ & $r = 3^x$ ✓ substitution / *vervanging* 3 ✓ answer / *antwoord* (3)
		[8]

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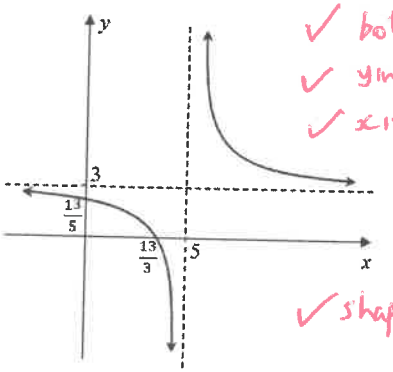
QUESTION 4/*VRAAG 4*

4.1	$f(x)=\frac{2}{x-5}+3$ $x=5$ ✓ $y=3$ ✓	✓ $x=5$ ✓ $y=3$ (2)
4.2	$y \in \mathbb{R}$ but/*maar* $y \neq 3$ (OR) $y \in (-\infty;3)$ or $(3;\infty)$	✓ $y \neq 3$ (1)
4.3	$f(x)=\frac{2}{x-5}+3$ x – intercept / x – *afsnit*: $\frac{2}{x-5}+3=0$ ✓ $\frac{2}{x-5}=-3$ $-3x+15=2$ $x=\frac{13}{3}$ ✓ y – intercept / y – *afsnit*: $y=\frac{2}{0-5}+3$ $=\frac{13}{5}$ ✓ ∴ Intercepts/*Afsnitte* : $(\frac{13}{3};0)$ and / *en* $(0;\frac{13}{5})$	✓ substitution / *vervanging* ✓ $x=\frac{13}{3}$ ✓ $y=\frac{13}{5}$ (3)
4.4		✓ asymptotes / *asimptote* ✓ *y*-intercept / *y-afsnit* ✓ *x*-intercept / *x-afsnit* ✓ shape and quadrants *vorm* en *kwadrante* (4)
4.5	f is reflected in the x-axis and shifted 2 units downwards. *f is gereflekteer in die x-as en 2 eenhede afwaarts geskuif.* **OR/*OF*** f is shifted 2 units upwards and then reflected in the x-axis. *f is 2 eenhede opwaarts geskuif en daarna gereflekteer in die x-as.*	✓ $f(x)$ reflected / *gereflekteer* ✓ in the x-axis / *in die x-as* ✓ shift 2 units / *skuif 2 eenhede* downwards/upwards *afwaarts/opwaarts* (3)
	–	**[13]**

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4.5. $f: \quad y = \frac{2}{x-5} + 3$

. reflect in x-axis

$$-y = \frac{2}{x-5} + 3$$

$$\therefore \quad y = -\frac{2}{x-5} - 3$$

. shift/translate **2 units downwards**

$$\therefore \quad y = -\frac{2}{x-5} - 5$$

ie. $h(x) = -\frac{2}{x-5} - 5$

OR

$f: \quad y = \frac{2}{x-5} + 3$

. shift/translate 2 units upwards

$$y = \frac{2}{x-5} + 5$$

. reflect in x-axis

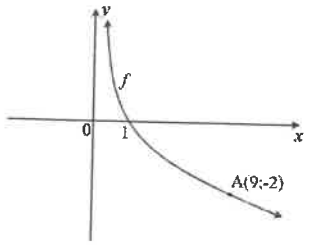
$$-y = \frac{2}{x-5} + 5$$

$$y = -\frac{2}{x-5} - 5$$

ie. $h(x) = -\frac{2}{x-5} - 5$

QUESTION 5/*VRAAG 5*

5.



5.1

$f(x) = \log_b x$

$x = b^y$

$9 = b^{-2}$ ✓

$b^2 = \frac{1}{9}$

$b = \frac{1}{3}$

method ✓

$\pm(9)^{-\frac{1}{2}} = \pm(b^{-2})^{-\frac{1}{2}}$

$\frac{1}{3} = b$

(reject −) → (2)

NB $-2\sqrt{\ }$ not acceptable !!

✓ substitution / *vervanging*

✓ method

(2)

5.2

$y = \log_{\frac{1}{3}} x$

$x = \log_{\frac{1}{3}} y$ ✓

$y = \left(\frac{1}{3}\right)^x$ ✓ **OR/*OF*** $y = 3^{-x}$

(2)

✓ swopping x and y
omruil van x en y

✓ answer / *antwoord*

(2)

5.3

$0 < x \leq 1$ ✓✓ A

(2)

✓✓ answer (Accuracy)
antwoord (Akkuraatheid)

(2)

5.4

PTO

$y = 0$ ✓✓ A

(2)

✓✓ answer (Accuracy)
antwoord (Akkuraatheid)

(2)

[8]

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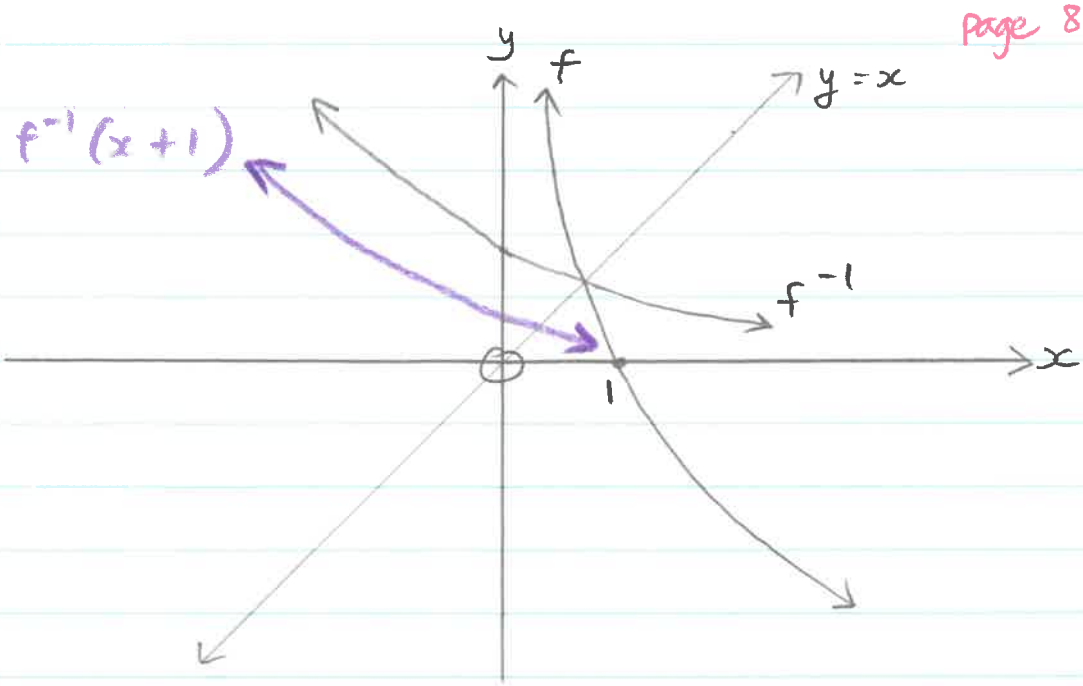
54.



$g(x) = f^{-1}(x+1)$

g = f^{-1} translated 1 unit horizontally to the left

∴ horizontal asymptote is still the x-axis

∴ $y = 0$ ⟶

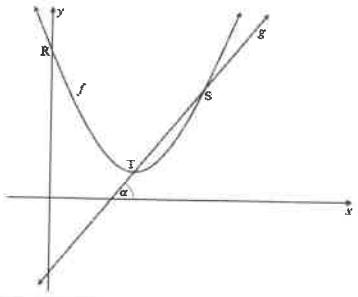
OR

$f^{-1}(x) = 3^x$

$f^{-1}(x+1) = 3^{x+1}$

ha: $y = 0$ ⟶

QUESTION 6/*VRAAG 6*



6.1

$f(x) = x^2 - 6x + 11$

$= x^2 - 6x + 9 - 9 + 11$

$= (x-3)^2 + 2$

$\therefore$ At TP : $x = 3$ and / *en* $y = 2$

OR/*OF*

$f(x) = x^2 - 6x + 11$

$x = -\frac{b}{2a} = -\frac{(-6)}{2(1)}$ ✓ sub

$= 3$

$\therefore y = 3^2 - 6(3) + 11$ ✓ sub

$= 2$

$\therefore$ At TP : $x = 3$ and / *en* $y = 2$

T (✓3; ✓2)

4

✓ completing the square *vierkantsvoltooiing*

✓ $(x-3)^2 + 2$

✓✓ values for x and y *waardes van x en y*

✓ substitution / *vervanging*

✓ value of x / *waarde van x*

✓ substitution / *vervanging*

✓ value of y / *waarde van y*

(4)

6.2

$m_g = \tan 63,44°$

$= 2$ ✓

$y - 2 = 2(x-3)$

$y = 2x - 4$ ✓

$y = 2x + c$

sub $T(3;2)$

$2 = 2(3) + c$ ✓

$-4 = c$

3

✓ $m_g = 2$

✓ substitution / *vervanging*

✓ equation of g / *vergelyking van g*

(3)

6.3

$f(x) = g(x)$ ✓

$x^2 - 6x + 11 = 2x - 4$

$x^2 - 8x + 15 = 0$ ✓

$(x-3)(x-5) = 0$

$x = 3$ or / *of* $x = 5$ ✓

$\therefore y = 2(5) - 4$

$= 6$

$\therefore S(5\ ;\ 6)$ ✓

CA only if g is linear
VA slegs as g linieêr is

4

✓ equating / *gelyk stel*

✓ standard form / *standaardvorm*

✓ x values / *x-waardes*

✓ S coordinates / S-*koördinate*

(4)

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6.4.1 PTO	$1 \leq x \leq 5$ ✓✓	2	✓✓ answer / *antwoord* (2)
6.4.2 PTO	$k \leq -2$ ✓✓ Accept / *Aanvaar* $k < -2$ for 1 mark / *vir 1 punt*	2	✓✓ answer / *antwoord* (2)
			[15]

QUESTION 7/*VRAAG 7*

7.1	$A = P(1+i)^n$ ✓ i $166\,433 = 97\,000\left(1+\frac{0,091}{4}\right)^n$ ✓ $\frac{166\,433}{97\,000} = \left(\frac{4\,091}{4\,000}\right)^n$ $\therefore n = \frac{\log\left(\frac{166\,433}{97\,000}\right)}{\log\left(\frac{4091}{4000}\right)}$ ✓ logs $= 24$ quarters $\therefore$ 6 *years / jaar* ✓ $\div 4$	4	✓ $\frac{0.091}{4}$ $\frac{0,91}{400}$ ✓ substitution into correct formula *vervanging in korrekte formule* ✓ correct use of logs *korrekte gebruik van logs* ✓ answer / *antwoord* (4)
7.2.1	$A = P(1-i)^n$ $= 482000(1-0,147)^5$ ✓ $\frac{14,7}{100}$ $= R217666,80$ ✓	2	✓ substitution into correct formula *vervanging in korrekte formule* ✓ answer / *antwoord* (2)
7.2.2	$A = P(1+i)^n$ $= 482\,000(1+0,081)^5$ ✓ $\frac{8,1}{100}$ $= R711500,99$ ✓	2	✓ substitution into correct formula *vervanging in korrekte formule* ✓ answer / *antwoord* (2)

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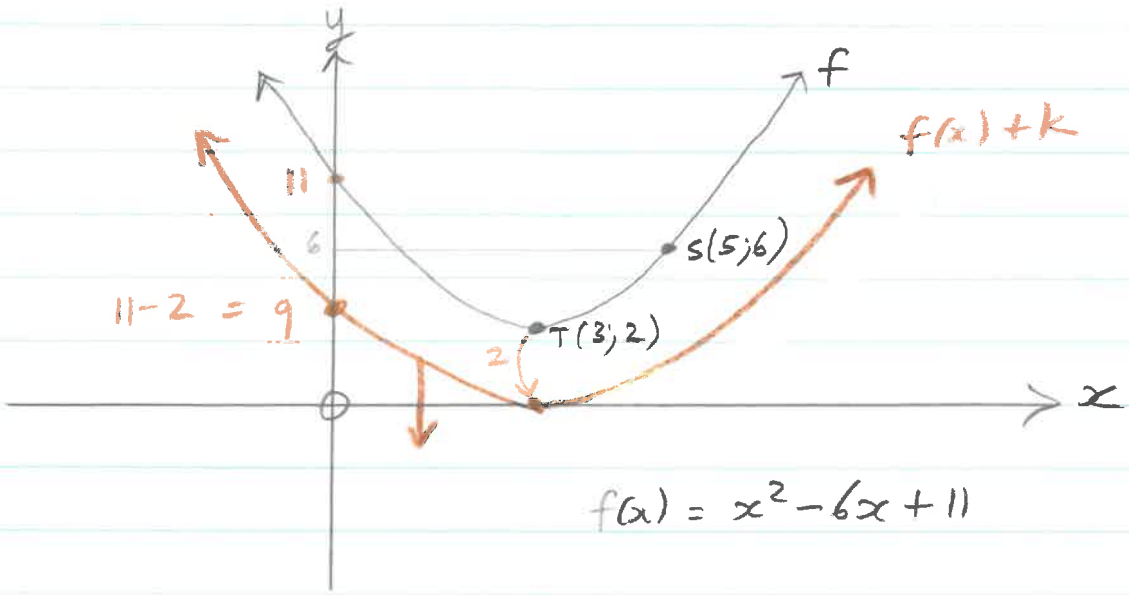
6.4.



$f(x) = x^2 - 6x + 11$

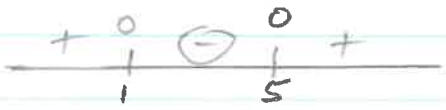
6.4.1. $f(x) \leq 6$

$y_f \leq 6$

$6 \geq x^2 - 6x + 11$

$0 \geq x^2 - 6x + 5$

$0 \geq (x-1)(x-5)$



$1 \leq x \leq 5$

$\therefore$

$\frac{x+5}{2} = 3$

$\times 2$: $x + 5 = 6$

$x = 1$

$1 \leq x \leq 5$

$6 = x^2 - 6x + 11$

$0 = x^2 - 6x + 5$

$0 = (x-1)(x-5)$

$\therefore x = 1$ or 5

$1 \leq x \leq 5$

6.2. $y = f(x) + k$ real x-ints

y_{int} (f): $y = 11$

y_{int} (f + k): $y = x^2 - 6x + 11 + k$ ($11 + k$ = y_{int}) ↑↓

$y_{int} \leq 9$

$11 + k \leq 9$

$k \leq -2$

7.2.3 PTO	Required amount / *Bedrag benodig*: $= R711\,500,99 - R217\,666,80$ $= R493\,834,19$ $F = \frac{x[(1+i)^n - 1]}{i}$ $493\,834,20 = \frac{x\left[\left(1+\frac{0,073}{12}\right)^{60} - 1\right]}{\frac{0,073}{12}}\left(1+\frac{0,073}{12}\right)$ $\therefore x = \frac{493\,834,20 \times \frac{0,073}{12}}{\left[\left(1+\frac{0,073}{12}\right)^{60} - 1\right]\left(1+\frac{0.073}{12}\right)}$ $= R6803,01$	✓ amount / *bedrag* ✓ correct formula / *korrekte formule* ✓ $n = 60$ *and / en* $i = \frac{0,073}{12}$ ✓ $\frac{x\left[\left(1+\frac{0,073}{12}\right)^{60} - 1\right]}{\frac{0,073}{12}}$ ✓ $\times\left(1+\frac{0,073}{12}\right)$ ✓ answer / *antwoord* (6) **[14]**

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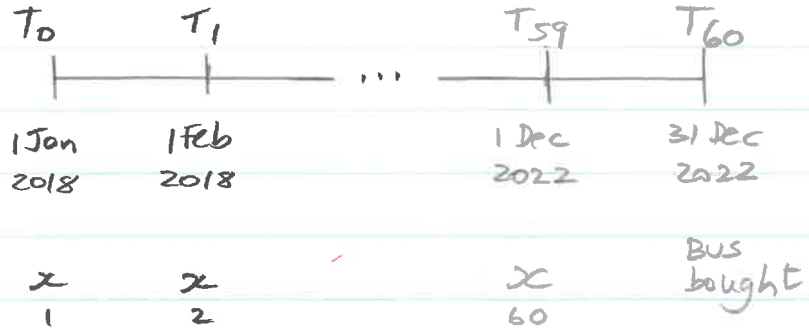
7.2.3.



At T_{60} (31 Dec 2022)

$$SF = 711\,500,99 - 217\,666,80$$
$$= 493\,834,19 \quad ✓$$

At T_{59} : $A = P(1+i)^n$

$$493\,834,19 = P\left(1+\frac{7,3}{1200}\right)^1$$
$$490\,848,19\ldots = P \quad ✓$$

F formula ✓

$$F = \frac{x\left[(1+i)^n - 1\right]}{x} \qquad i = \frac{7,3}{1200} \ ✓ \qquad n = 60$$

$$490\,848,19\ldots = \frac{x\left[\left(1+\frac{7,3}{1200}\right)^{60} - 1\right]}{\frac{7,3}{1200}} \quad ✓ \text{RHS}$$

$$x = R\ 6\,803,01 \quad ✓$$

6

$493\,834,19 \xrightarrow{n\ 60}$ R 6 844,40 5/6 •
$493\,834,19 \xrightarrow{n\ 59}$ R 6 982,82 4/6 ••
$493\,834,19 \xrightarrow{n\ 48}$ R 8 890,17 3/5

QUESTION 8/*VRAAG 8*

8.1

$f(x)=1-x^2$

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

$$=\lim_{h\to 0}\frac{1-(x+h)^2-(1-x^2)}{h}$$

$$=\lim_{h\to 0}\frac{1-x^2-2xh-h^2-1+x^2}{h}$$

$$=\lim_{h\to 0}\frac{-2xh-h^2}{h}$$

$$=\lim_{h\to 0}\frac{h(-2x-h)}{h}$$

$$=\lim_{h\to 0}(-2x-h)$$

$$=-2x$$

✓ substitution / *vervanging*

✓ expansion / *uitbreiding*

✓ simplification / *vereenvoudiging*

✓ factorisation / *faktorisering*

✓ answer / *antwoord*

(5)

OR/*OF*

$f(x)=1-x^2$

$f(x+h)-f(x)=1-(x+h)^2-(1-x^2)$

$=1-x^2-2xh-h^2-1+x^2$

$=-2xh-h^2$

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

$$=\lim_{h\to 0}\frac{-2xh-h^2}{h}$$

$$=\lim_{h\to 0}\frac{h(-2x-h)}{h}$$

$$=\lim_{h\to 0}(-2x-h)$$

$$=-2x$$

✓ substitution / *vervanging*

✓ expansion / *uitbreiding*

✓ simplification / *vereenvoudiging*

✓ factorisation / *faktorisering*

✓ answer / *antwoord*

(5)

8.2.1

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

$$=D_x\left(x^2+x^{-2}-2\right)$$

$$=2x-2x^{-3}$$

✓ $D_x\left(x^2+x^{-2}-2\right)$

✓ $2x$ *and / en* constant/*konstante* is 0

✓ $-2x^{-3}$

(3)

8.2.2

$$y=\frac{x^5}{10}-\frac{2}{\sqrt{x}}$$

$$=\frac{1}{10}x^5-2x^{-\frac{1}{2}}$$

$$\therefore\frac{dy}{dx}=\frac{1}{2}x^4+x^{-\frac{3}{2}}$$

✓ $2x^{-\frac{1}{2}}$

✓ $\frac{1}{2}x^4$ ✓ $x^{-\frac{3}{2}}$

(3)

[11]

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QUESTION 9/*VRAAG 9*

9.1 PTO	$f(x)=-2x^3+ax^2+bx-3$ (2;9) $9=-2(2)^3+a(2)^2+b(2)-3$ ✓ $9=-16+4a+2b-3$ $4a+2b=28$.....(1) At TP / *By DP*: $-6x^2+2ax+b=0$ ✓f' $-6(2)^2+2a(2)+b=0$ ✓ $4a+b=24$.....(2) $4a+2b=28$ $4a+b=24$ (1) − (2) $b=4$ → $4a+4=24$ $4a=20$ $a=5$ → 5 ao 0/5	✓ equation 1 / *vergelyking* 1 ✓ $f'(x)=-6x^2+2ax+b$ ✓ equation 2 / *vergelyking* 2 ✓ value of b / *waarde van b* ✓ value of a / *waarde van a* (5)
9.2	$f(x)=-2x^3+5x^2+4x-3$ $f'(x)=-6x^2+10x+4$ At/*By* E: $-6x^2+10x+4=0$ ✓ $3x^2-5x-2=0$ $(3x+1)(x-2)=0$ $\therefore x=-\frac{1}{3}$ or / *of* $x=2$ ✓ 3 $y=-2(-\frac{1}{3})^3+5(-\frac{1}{3})^2+4(-\frac{1}{3})-3$ $=-\frac{100}{27}$ $\therefore E\left(-\frac{1}{3};-\frac{100}{27}\right)$ ✓ →	✓ $f'(x)=0$ ✓ values of x / *waarde van x* ✓ both coordinates / *beide koördinate* (3)
9.3.1 PTO	$x<-\frac{1}{3}$ *or / of* $x>2$ → 2 ✓ OR ✓	✓ $x<-\frac{1}{3}$ ✓ $x>2$ (2)

$x \in (-\infty;-\frac{1}{3})$ or $(2;\infty)$

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9.1. $f(x) = -2x^3 + ax^2 + bx - 3$

sub D(2; 9)

$9 = -2(2)^3 + a(2)^2 + b(2) - 3$

$28 = 4a + 2b$

$\div 2$: $14 = 2a + b$ $\therefore b = 14 - 2a$

$f'(x) = -6x^2 + 2ax + b$

sub D(2; 9)

$0 = -6(2)^2 + 2a(2) + b$

$24 = 4a + b$

$\therefore 24 = 4a + 14 - 2a$

$10 = 2a$

$5 = a$ ⟶

$\therefore b = 14 - 2(5)$

$= 4$ ⟶

9.2.1. $f'(x) < 0$ ie decreasing

$f(x) = -2x^3 + 5x^2 + 4x - 3$

$f'(x) = -6x^2 + 10x + 4$

$-6x^2 + 10x + 4 < 0$

$\div -2$: $3x^2 - 5x - 2 > 0$

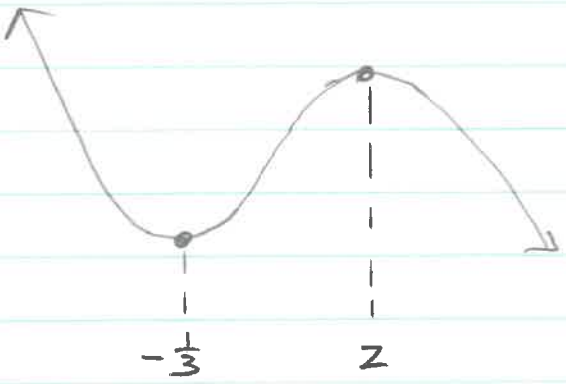
$(x - 2)(3x + 1) > 0$

⊕ ∘ − ∘ ⊕

$-\frac{1}{3}$ 2

$x < -\frac{1}{3}$ or $2 < x$ ⟶

OR



from 9.2.

$f'(x) < 0$ $\therefore$ decreasing

$\therefore$ $x \in (-\infty; -\frac{1}{3})$ or $(2; \infty)$

9.3.2	$f''(x) = -12x + 10$ $-12x + 10 = 0$ $x = \frac{5}{6}$ $\therefore x > \frac{5}{6}$ **OR/*OF*** $x = -\frac{b}{3a}$ $= -\frac{5}{3(-2)}$ $= \frac{5}{6}$ $\therefore x > \frac{5}{6}$	✓ $f''(x) = -12x + 10$ ✓ value of x / *waarde van x* ✓ answer / *antwoord* (3) **OR/*OF*** ✓ substitution / *vervanging* ✓ value of x / *waarde van x* ✓ answer / *antwoord* (3)
9.4	$f'(x) = -6x^2 + 10x + 4$ $m = f'(-1) = -6(-1)^2 + 10(-1) + 4$ $= -12$ $\therefore y = -12x + c$ $0 = -12(-1) + c$ $c = -12$ $y = -12x - 12$	✓ $f'(x) = -6x^2 + 10x + 4$ ✓ m ✓ substitution / *vervanging* ✓ answer / *antwoord* (4)
		[17]

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9.3.2. $f'(x) = -6x^2 + 10x + 4$ from 9.3.1

$f''(x) = -12x + 10$

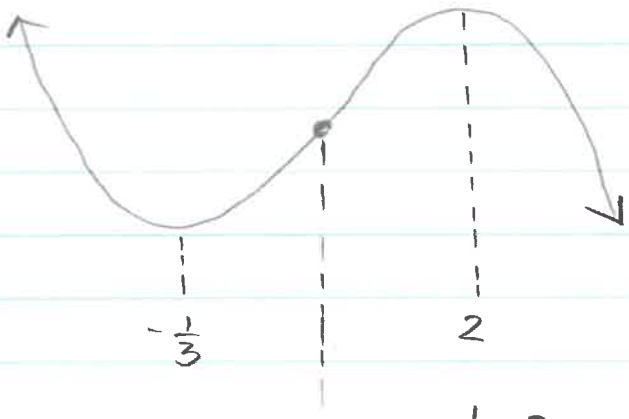
concave down $f''(x) < 0$

$-12x + 10 < 0$

$-12x < -10$

$x > 5/6$

OR



$x_{poi} = \frac{-\frac{1}{3} + 2}{2}$

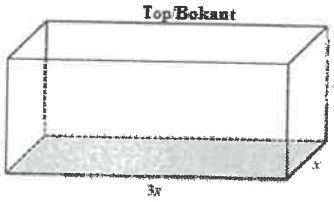
$= 5/6$

concave down

$\therefore \quad x \in (\frac{5}{6}; \infty)$

QUESTION 10/*VRAAG 10*

10.1



TSA

$= \square x + 2 \square x + 2 \square y$ (3x; y; 3x)

$= 3x.x + 2.xy + 2.3x.y$

$3x^2 + 2xy + 6xy = 147$ ✓

$3x^2 + 8xy = 147$ ✓ $8xy = 147 - 3x^2$

$\therefore y = \dfrac{147 - 3x^2}{8x}$ ✓

2

✓ $3x^2 + 2xy + 6xy = 147$

✓ simplifying / *vereenvoudiging*

(2)

10.2

$V = lbh$

$= 3x.x.y$ ✓

$= 3x^2\left(\dfrac{147 - 3x^2}{8x}\right)$ ✓

$= \dfrac{441x}{8} - \dfrac{9x^3}{8}$

$= \frac{441}{8}x - \frac{9}{8}x^3$

$V'(x) = \dfrac{441}{8} - \dfrac{27x^2}{8}$

$V = A_{base} \times \perp h$

$= \square x \times y$ (3x)

$= 3x.x.y$

$= 3x^2y$

5

✓ $3x.x.y$

✓ substitution / *vervanging*

✓ $V'(x) = 0$

$\therefore \dfrac{441}{8} - \dfrac{27x^2}{8} = 0$ ✓

$27x^2 = 441$

$x^2 = \dfrac{441}{27}$ ✓

$x = \dfrac{21}{3\sqrt{3}}$ $(= 4{,}04)$ ✓ (reject -)

$\frac{7\sqrt{3}}{3}$ $\frac{7}{\sqrt{3}}$

✓ simplification / *vereenvoudiging*

✓ answer / *antwoord*

(5)

[7]

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11.2.2	$5 \times 25 \times 24 \times 9 \times 8 \times 3$ $= 648\,000$ $P(\text{Vowel / Factor of 9}) / P(\textit{Vokaal / Faktor van 9})$ $= \frac{648\,000}{11232\,000}$ $= \frac{3}{52}$	✓ $5 \times 25 \times 24$ ✓ $9 \times 8 \times 3$ ✓ 11232 000 as denominator / *as noemer* ✓ answer / *antwoord* (4)

TOTAL/*TOTAAL:* 150

5 25 24 9 8 3

vowel
a e i o u
5

factors of 9
1 3 9
3

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QUESTION 11/*VRAAG 11*

	WATCH SOCCER/ *KYK SOKKER*	WATCH RUGBY/ *KYK RUGBY*	TOTAL/ *TOTAAL*
Female / *Vroulik*	72	*a* 48	120
Male / *Manlik*	54	36	90
Total / *Totaal*	*b* 126	84	210

11.1.1

$a = 48$ ✓
$b = 126$ ✓

2

✓ $a = 48$
✓ $b = 126$

(2)

11.1.2

$P(F \text{ and/en } WS) = \frac{72}{210}$ ✓✓

$\frac{12}{35}$ 2

✓✓ answer / *antwoord*

(2)

11.1.3

(For independent events) / (*Vir onafhanklike gebeurtenisse*)
$P(M) \times P(R) = P(M \text{ and / } en \ R)$

$P(M) \times P(R) = \frac{90}{210} \times \frac{84}{210}$ ✓
$= \frac{6}{35}$ ✓

$P(M \text{ and / } en \ R) = \frac{36}{210}$
$= \frac{6}{35}$ ✓

∴ The events are independent ✓
as $P(M \text{ and } R) = P(M) \times P(R)$

4

✓ $\frac{90}{210} \times \frac{84}{210}$

✓ answer / *antwoord*

✓ $\frac{36}{210}$

✓ conclusion / *gevolgtrekking*

(4)

11.2.1

26	25	24	10	9	8

26 x 25 x 24 x 10 x 9 x 8 ✓
= 11 232 000 ✓

2

✓ method / *metode*
✓ answer / *antwoord*

(2)

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Notes Hayi ke !!!!! Still !!!!

1. Start each new QUESTION at the top of a new page.

   – been asking and explaining why since Grade 10

2. When you solve an equation by squaring both sides, SOLUTIONS MUST BE CHECKED

   – Gr 11 : ST June P1 Nov P1
   – Gr 12 : June P1 Sept P1

   The 5th time it has been assessed formally and some learners are still not checking solutions.

3. Please leave 2 lines open between all answers.

   3.1. ...

   ++ (2 lines)

   3.2. ....

SU