Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 10

NOVEMBER 2020

MATHEMATICS P1 (EXEMPLAR)

MARKS: **100**

TIME: **2 hours**

This question paper consists of 7 pages, including a 1-page diagram sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of SEVEN questions.
2. Answer ALL the questions.
3. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answers.
4. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
5. Answers only will NOT necessarily be awarded full marks.
6. If necessary, round off answers to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. Number the answers correctly according to the numbering system used in this question paper.
9. Write neatly and legibly.

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QUESTION 1

1.1 Factorise the following expressions fully:

1.1.1 $4y^2 - 16$ (1)

1.1.2 $\dfrac{x^3 - 1}{x^2 + x + 1}$ (2)

1.1.3 $x - 1 + y - xy$ (2)

1.2 Simplify the following expressions fully:

1.2.1 $\dfrac{3 - 3x}{x^2 - 3x + 2}$ (3)

1.2.2 $\dfrac{16^{-x}.12^{x+1}}{3^x.4^{-x}}$ (3)

1.3 Given that: $m = x(x - y)^2$

Determine the value of m if $xy^2 = 4$ and $x^3 - 2x^2y = 3$ (3)

[14]

QUESTION 2

2.1 Solve for x without the use of a calculator:

2.1.1 $x^3 = 9x$ (3)

2.1.2 $P = \dfrac{3}{2}x(PQ^2 - Pq^2)$ (4)

2.1.3 $3x^{\frac{3}{4}} = 81$ (2)

2.2 Solve for x if:

2.2.1 $3(2 - 3x) \geq 15$ (3)

2.2.2 Hence, represent your answer to QUESTION 2.2.1 on a number line. (1)

2.3 Solve simultaneously for x and y:

$3x + 2y = 13$ and $3x = 2 - y$ (4)

[17]

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QUESTION 3

Given the linear pattern: $2x + 2\ ;\ 3x + 4\ ;\ 5x + 6\ ;\ \ldots$

3.1 If $x = 0$, calculate the numerical value of the fourth term.

Hence determine the nth term of the sequence. (4)

3.2 Calculate the value of the 18th term. (2)

3.3 Which term in the sequence will be equal to 108? (2)

3.4 Determine the largest value of n for which $T_n < 166$. (3)

3.5 The following values are the multiples of five from the number pattern:

5; 10; 15; 20; …

Determine the 16th even number of this pattern. (3)

[14]

QUESTION 4

4.1 Sylvia wants to buy a Defy dishwasher which is priced at R9 899 by means of a hire purchase agreement.

The conditions of the hire purchase agreement are as follows:

- Sylvia must pay a 30% deposit of the purchase price
- Interest is charged at 12% per annum simple interest on the balance
- Compulsory monthly insurance premium of R65,30
- The balance must be paid in monthly instalments
- Account should be settled in 36 months

4.1.1 Calculate the balance after Sylvia has paid the deposit. (2)

4.1.2 Calculate her monthly instalment, if the settlement must be settled in 36 months. (5)

4.2 The table below shows the exchange rate of the British pound and the US dollar in South African rand.

COUNTRY	UNIT	EXCHANGE RATE
USA	Dollar ($)	R16,24
England	Pound (£)	R27,63

4.2.1 George, a visitor from England, saw an industrial textile machine on sale for $6 800. This machine is suitable for his business back at home. The cost for a similar machine in England is £4 600. Calculate in which country will it be cost saving for George to buy the machine. (3)

4.2.2 To install an outdoor swimming pool will cost you £800 in England. How much will it cost you to install a swimming pool of the same capacity in South African rand? (2)

[12]

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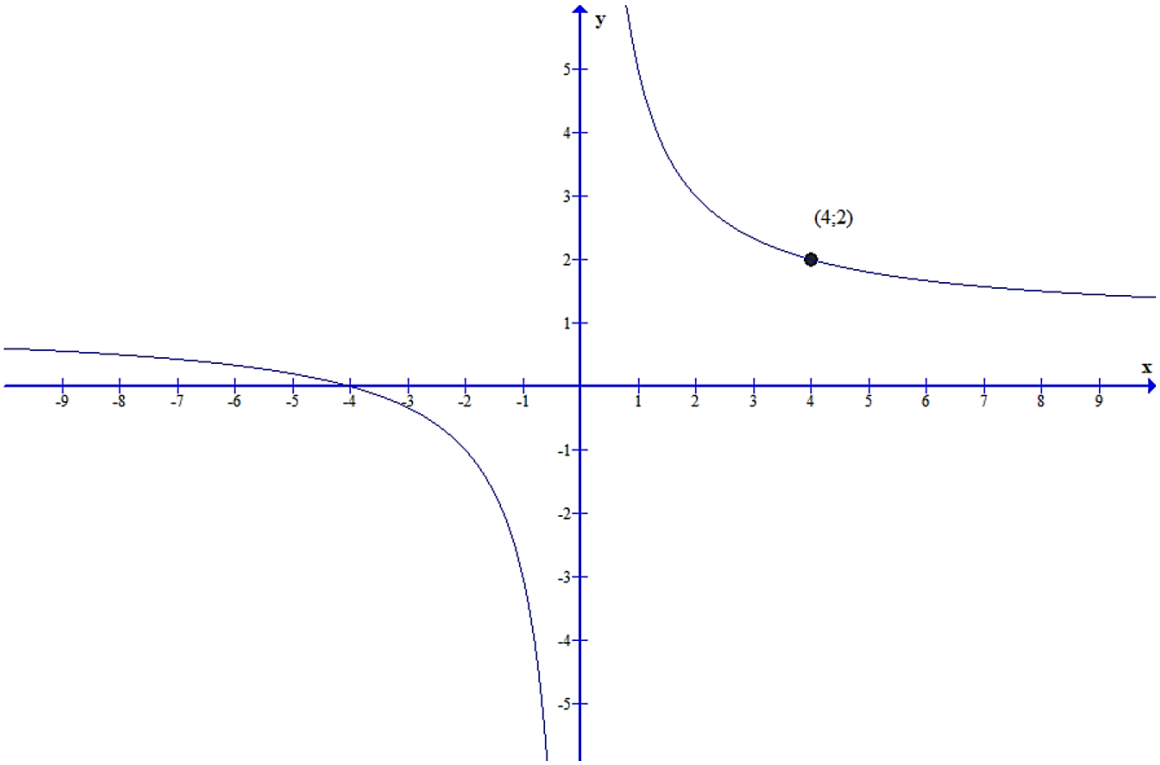
QUESTION 5

The equation of the function $g(x) = \frac{a}{x} + q$ is shown below. It passes through the point (4 ; 2) on the graph of g and has a range of $y \in (-\infty; 1) \cup (1; \infty)$.



5.1 Determine the:

5.1.1 Equation of g (3)

5.1.2 Equation of h, the axis of symmetry of g which has a positive gradient (2)

5.2 Sketch the graph of h on the provided diagram sheet. Clearly show ALL the asymptotes and intercepts with the axes. (4)

5.3 Write the equations of the asymptotes of f if $f(x) = -g(x) + 3$. (3)

5.4 Use the graphs to determine the value(s) of x for which:

5.4.1 $g(x) = h(x)$ (2)

5.4.2 $g(x) \leq h(x)$ where $(x < 0)$ (2)

[16]

QUESTION 6

Given: $f(x) = 3^x - 1$ and $g(x) = \frac{1}{x+1}$

6.1 Sketch the graphs of f and g on the same set of axes, using the provided diagram sheet. Clearly indicate all intercept points with the *x*-axis and the *y*-axis as well as any asymptotes. (6)

6.2 Using your graph, write down the coordinates of the point of intersection of f and g (where $x > 0$). (2)

6.3 What is the range of f? (1)

6.4 Write down the domain of g. (2)

6.5 Write down the equation of the asymptotes of g. (2)

6.6 Determine the values of x where $g(x) \leq 0$ where $x < -2$ (2)

[15]

QUESTION 7

7.1 An entire sample space is made up of two complementary events, S and T, where P(S') = 0,33.

7.1.1 Complete the statement: P(S) + P(T) = … (1)

7.1.2 Write down the value of P(T). (1)

7.2 A survey was conducted among 180 residents of a small town to establish how many people contracted tuberculosis (TB) and/or human immunodeficiency virus (HIV) during the last 5 years. The results were as follows:

- x people were diagnosed with TB
- 30 people were diagnosed with both TB and HIV
- 69 people were HIV positive
- 51 people did not have either disease

7.2.1 Represent the information above in a Venn diagram. (4)

7.2.2 How many people contracted TB only? (3)

7.2.3 Calculate the probability that a person selected at random:

(a) Will only have been diagnosed with TB (2)

(b) Will not have any of the two diseases (1)

[12]

TOTAL: 100

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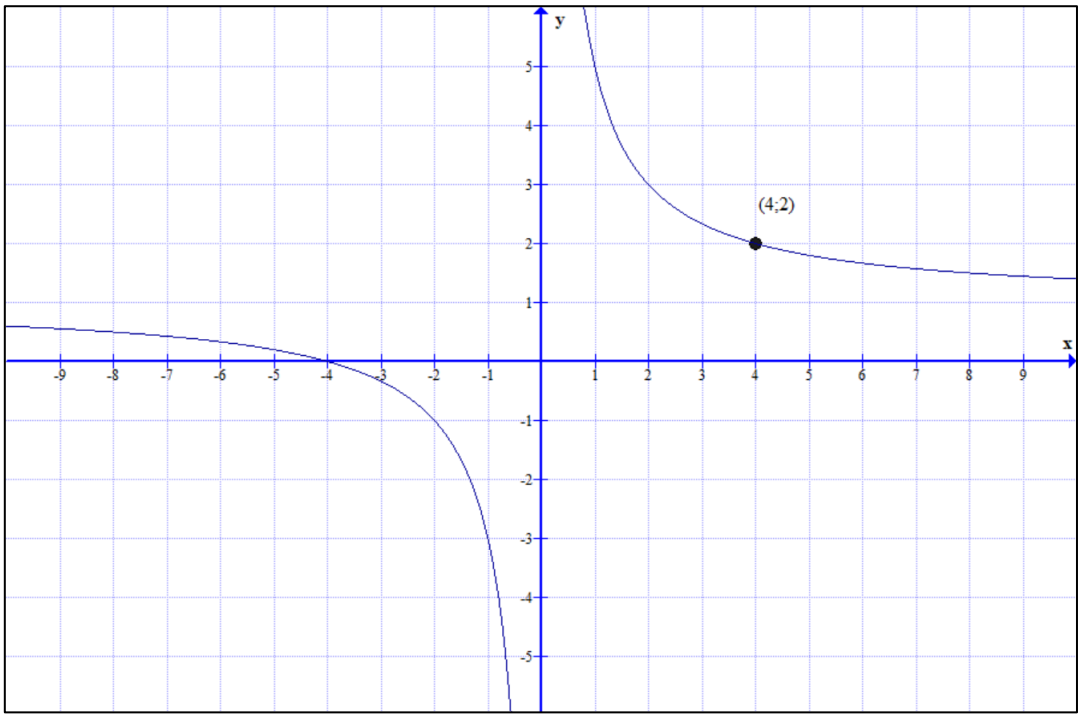
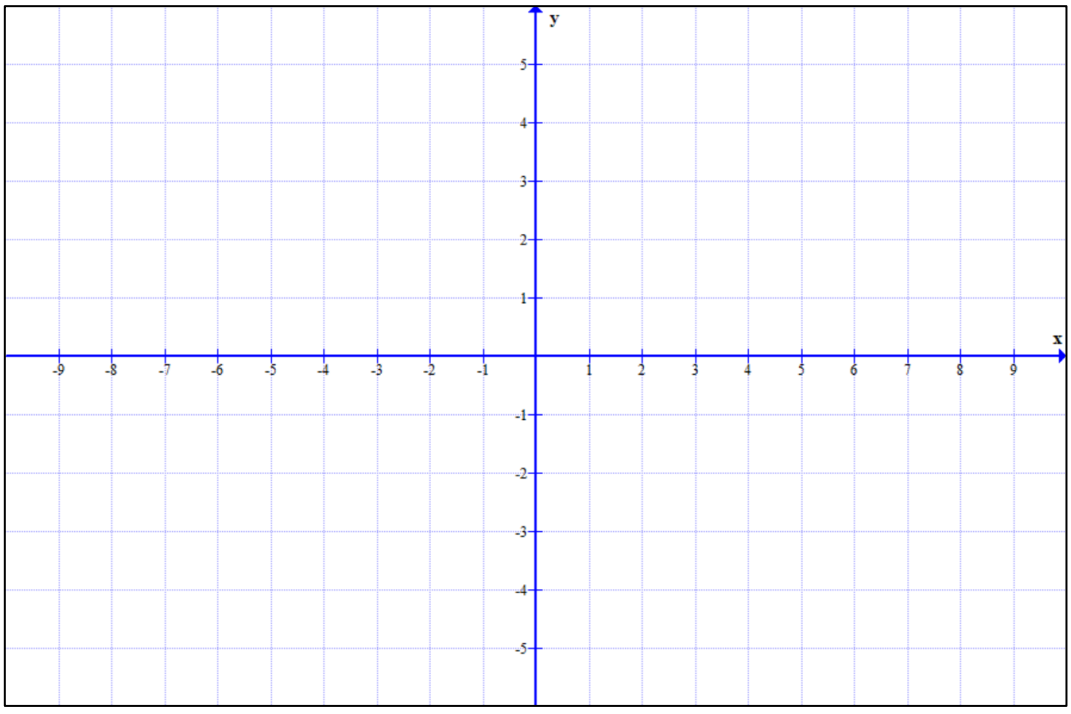
DIAGRAM SHEET

QUESTION 5.2



(4)

QUESTION 6.1



(6)

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Province of the
EASTERN CAPE
EDUCATION

NATIONAL SENIOR CERTIFICATE/ *NASIONALE SENIOR SERTIFIKAAT*

GRADE/*GRAAD* 10

NOVEMBER 2020

MATHEMATICS P1/*WISKUNDE V1* MARKING GUIDELINE/*NASIENRIGLYN* (EXEMPLAR/*EKSEMPLAAR*)

MARKS/*PUNTE*: 100

This marking guideline consists of 10 pages. /
Hierdie nasienriglyn bestaan uit 10 bladsye.

NOTE:

- If a candidate answered a question TWICE, mark only the FIRST attempt.
- If a candidate crossed out an answer and did not redo it, mark the crossed-out answer.
- Consistent accuracy applies to ALL aspects of the marking guidelines.
- Assuming values/answers in order to solve a problem is unacceptable.

LET WEL:

- *As 'n kandidaat 'n vraag TWEE keer beantwoord het, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord deurgehaal en nie oorgedoen het nie, sien die deurgehaalde antwoord na.*
- *Volgehoue akkuraatheid is op ALLE aspekte van die nasienriglyne van toepassing.*
- *Dit is onaanvaarbaar om waardes/antwoorde te veronderstel om 'n probleem op te los.*

QUESTION/*VRAAG* 1			
1.1.1	$4y^2 - 16$ $= 4(y^2 - 4)$ $= 4(y - 2)(y + 2)$ **OR/*OF*** $4y^2 - 16$ $=(2y - 4)(2y + 4)$ $=2(y - 2))2(y + 2)$ $=4(y - 2)(y + 2)$	✓ answer/*antwoord* ✓ answer/*antwoord*	(1) (1)
1.1.2	$\frac{x^3 - 1}{x^2 + x + 1}$ $= \frac{(x - 1)(x^2 + x + 1)}{x^2 + x + 1}$ $= x - 1$	✓ factorising/ *faktoriseer* ✓ answer/*antwoord*	(2)
1.1.3	$x - 1 + y - xy$ $= (x - 1) + y(1 - x)$ $= (x - 1) - y(x - 1)$ $= (x - 1)(1 - y)$	✓ common factor/ gemene faktor ✓ answer/*antwoord*	(2)
1.2.1	$\frac{3 - 3x}{x^2 - 3x + 2}$ $= \frac{3(1 - x)}{(x - 1)(x - 2)}$ $= \frac{-3(x - 1)}{(x - 1)(x - 2)}$ $= \frac{-3}{x - 2}$	✓ factorising numerator/ *faktorisering teller* ✓ factorising denominator/ *faktorisering noemer* ✓ answer/*antwoord*	(3)

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1.2.2	$\frac{16^{-x}.12^{x+1}}{3^x.4^{-x}}$ $= \frac{4^{-2x}.4^{x+1}.3^{x+1}}{3^x.4^{-x}}$ $= 4^{-2x+x+1+x} \times 3^{x+1-x}$ $= 4^1 \times 3^1$ $= 12$	✓ separating bases/ *opbreek van 12 and/en 16* ✓ addition of exponents/*optelling van eksponente* ✓ answer/*antwoord*	(3)
1.3	$m = x(x-y)^2$ $= x(x^2 - 2xy + y^2)$ $= x^3 - 2x^2y + xy^2$ $= 3 + 4$ $= 7$	✓ expansion/*uitbreiding* ✓ substitution/*vervanging* ✓ answer/*antwoord*	(3)
			[14]

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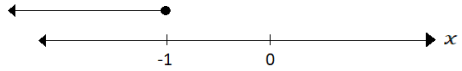
QUESTION/*VRAAG* 2			
2.1.1	$x^3 = 9x$ $x^3 - 9x = 0$ $x(x^2 - 9) = 0$ $x(x-3)(x+3) = 0$ $x = 0$ or/of $x = 3$ or/of $x = -3$	✓ factorisation/ *faktorisering* ✓ factors/*faktore* ✓ answer/*antwoord*	(3)
2.1.2	$P = \frac{3}{2}x(PQ^2 - Pq^2)$ $\Rightarrow \frac{3}{2}x(PQ^2 - Pq^2) = P$ $\frac{3}{2}x = \frac{P}{PQ^2 - Pq^2}$ $= \frac{P}{P(Q^2 - q^2)}$ $\therefore \quad x = \frac{P}{P(Q^2 - q^2)} \times \frac{2}{3}$ $= \frac{2}{3(Q^2 - q^2)}$	✓ $\div PQ^2 - Pq^2$ ✓ common factor/ P *gemene factor* P ✓ $\times \frac{2}{3}$ ✓ answer/*antwoord*	(4)
2.1.3	$3x^{\frac{3}{4}} = 81$ $x^{\frac{3}{4}} = 27$ $x^{\frac{3}{4}} = 3^3$ $\left(x^{\frac{3}{4}}\right)^{\frac{4}{3}} = (3^3)^{\frac{4}{3}}$ $x = 3^4$ $x = 81$	✓ divide both sides by 3 and both sides $(\,)^{\frac{4}{3}}$/ *deel beide kante deur 3 en beide kante* $(\,)^{\frac{4}{3}}$ ✓ answer/*antwoord*	(2)
2.2.1	$3(2-3x) \geq 15$ $6 - 9x \geq 15$ $-9x \geq 9$ $x \leq -1$ **OR/*OF*** $2 - 3x \geq 5$ $-3x \geq 3$ $x \leq -1$	✓ simplify/ *vereenvoudig* ✓ (≤) ✓ answer/*antwoord* ✓ simplify/ *vereenvoudig* ✓ (≤) ✓ answer/*antwoord*	(3) (3)
2.2.2		✓ answer/*antwoord*	(1)

2.3	$3x + 2y = 13$ _____(1) $3x = 2 - y$ _____(2) $y = 2 - 3x$ _____(3) Subs. (3) into (1) $3x + 2(2 - 3x) = 13$ $3x + 4 - 6x = 13$ $3x - 6x = 13 - 4$ $-3x = 9$ $x = -3$ $y = 2 - 3(-3)$ $= 2 + 9$ $y = 11$ **OR/*OF*** $3x + 2y = 13$ _____(1) $3x + y = 2$ _____(2) (1) – (2): y =11 Subs./*Verv.* $y = 11$ into (2) $3x + 11 = 2$ $3x = -9$ $\therefore \quad x = -3$ **OR/*OF*** $3x + 2y = 13$ _____(1) $3x + y = 2$ _____(2) (2) x 2: $6x + 2y = 4$ _____(3) (1)-(3) : $3x + 2y = 13$ $\underline{6x + 2y = 4}$ $-3x = 9$ $\therefore \quad x = -3$ Subst. $x = -3$ into (1)/*Vervang* $x = -3$ in (1) $3(-3) + 2y = 13$ $-9 + 2y = 13$ $2y = 22$ $y = 11$	✓ substitution/ *vervanging* 3de *vergelyking* ✓ simplification/ *vereenvoudig* ✓ x-value/x-waarde ✓ y-value/y-*waarde* ✓ subtract (2) from (1)/ *Trek (2) af vanaf (1)* ✓ y-value/y-*waarde* ✓ substitution/ *vervanging* ✓ x-value/x-*waarde* ✓ multiply (2) x 2/ *Maal (2) met 2* ✓ subtract (3) from (1)/ Trek (3) *af vanaf* (1) ✓ x-value/x-*waarde* ✓ y-value/y-*waarde*	(4) (4) (4)
			[17]

QUESTION/*VRAAG* 3			
3.1	$2(0)+2\,;3(0)+4\,;5(0)+6\,;\ldots$ $2\,;4\,;6\,;8$ $T_n = mn + c$ $8 = 2(4) + c$ $\Rightarrow 8 + c = 8$ $\therefore \quad c = 0$ $\therefore \quad T_n = 2n$ **OR/*OF*** 2 ; 4 ; 6 ; 8 d = 2 $T_1 = 2(1) = 2$ $T_2 = 2(2) = 4$ $T_3 = 2(3) = 6$ $T_4 = 2(4) = 8$ $\therefore T_n = 2n$	✓ fourth/*vierde* term ✓ substitution/*vervanging* ✓ value of/*waarde van* c ✓ answer/*antwoord* ✓ fourth/*vierde* term ✓ value of/*waarde van* d ✓ substitution/*vervanging* ✓ answer/*antwoord*	(4) (4)
3.2	$T_{18} = 2(18)$ $= 36$	✓ substitution/ *vervanging* ✓ answer/*antwoord*	(2)
3.3	$T_n = 2n$ $108 = 2n$ $\Rightarrow 2n = 108$ $\therefore \quad n = 54$	✓ $T_n = 108$ ✓ answer/*antwoord*	(2)
3.4	$2n < 166$ $n < 83$ T_{82} is the first term less than 166/ T_{82} *is die eerste term* < 166	✓ $2n < 166$ ✓ $n < 83$ ✓ conclusion/*afleiding*	(3)
3.5	5; 10; 15; 20; 25; 30; ….. 32 × 5 = 160 **OR/*OF*** 10; 20; 30; ;…… The 16th even number / *16de ewe getal* = 16 × 10 = 160	✓ 16th even = 32nd number in the pattern 16de *ewe* = 32ste *getal in die patroon*. ✓ 32 x 5 ✓ answer/*antwoord* ✓ Even numbers/*Ewe getalle* ✓ 16 x 10 ✓ answer/*antwoord*	(3) (3)
			[14]

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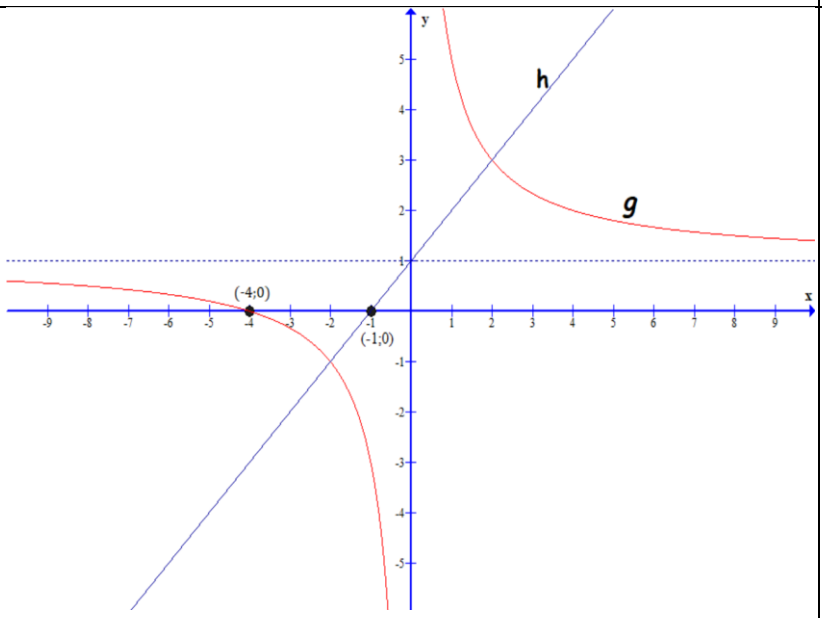
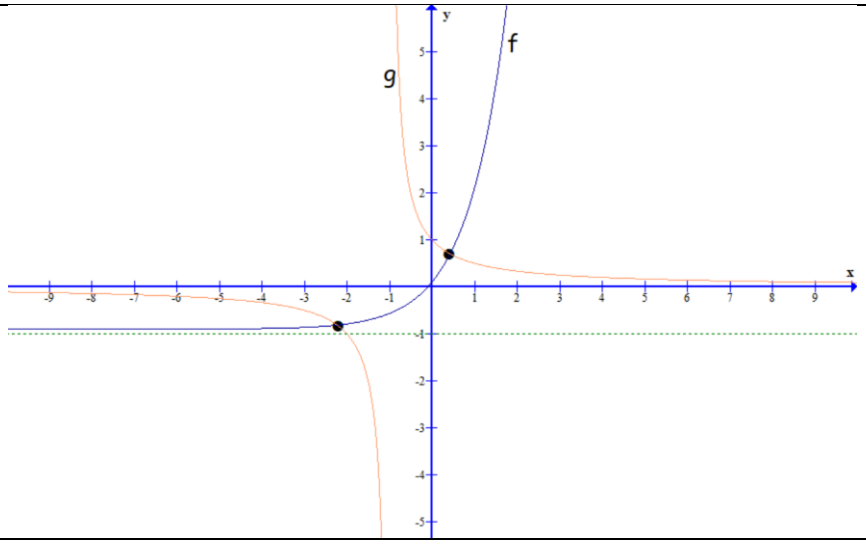
QUESTION/*VRAAG* 4			
4.1.1	$\frac{Deposit}{deposito} = \frac{30}{100} \times 9\,899$ $= R2\,969{,}70$ $\frac{Balance}{balans}: R9\,899 - R2\,969{,}70 = R6\,929{,}30$ **OR/*OF*** $\frac{70}{100} \times 9\,899$ $= R6\,929{,}30$	✓ deposit/*deposito* ✓ balance/*balans* ✓ $\frac{70}{100} \times 9\,899$ ✓ answer/*antwoord*	(2) (2)
4.1.2	$A = P(1 + in)$ $= 6\,929{,}30\,(1 + \frac{12}{100} \times 3)$ $A = R9\,423{,}85$ $Monthly\ payment = \frac{R9\,423{,}85}{36} + R65{,}30$ $Maandelikse\ paaiement = R327{,}07$	✓ substitution/ *vervanging* ✓ total payment/ *totale paaiement* ✓ $\div 36$ ✓ + R65,30 ✓ answer/*antwoord*	(5)
4.2.1	Cost of machine/*Koste van masjien* $\frac{6\,800}{27{,}63} \times 16{,}24 = £3\,996{,}82$ George will save money if he buys the machine in the USA / Machine is cheaper in the USA. / Machine is more expensive in England./ *George sal geld bespaar as hy die masjien in Amerika koop. / Masjien is goedkoper in Amerika / Masjien is duurder in Engeland.*	✓ $\frac{6800}{27{,}63} \times 16{,}24$ ✓ £3996,82 ✓ conclusion/ *gevolgtrekking*	(3)
4.2.2	$£800 \times 27{,}63$ $= R22\,104{,}00$	✓ correct conversion / *korrekte herleiding* ✓ answer/*antwoord*	(2)
			[12]

QUESTION/*VRAAG* 5			
5.1.1	$g(x) = \frac{a}{x} + q$ $2 = \frac{a}{4} + 1$ $\Rightarrow \frac{a}{4} + 1 = 2$ $\frac{a}{4} = 1$ $a = 4$ $g(x) = \frac{4}{x} + 1$	✓ $q = 1$ ✓ substitution/ *vervanging* ✓ answer/*antwoord*	(3)
5.1.2	$h(x) = x + 1$	✓ positive gradient/ *positiewe gradiënt* ✓ answer/*antwoord*	(2)
5.2		✓ asymptotes/ *asimptote* ✓ positive gradient of *h*/*positiewe gradiënt van h* ✓ *x*-intercept of *h*/ *x-afsnitte van h* ✓ points of intersection of g and *h*/*snypunte van g en h*	(4)
5.3	$f(x) = -\left(\frac{4}{x} + 1\right) + 3$ $= -\frac{4}{x} - 1 + 3$ $f(x) = -\frac{4}{x} + 2$ $x = 0$ $y = 2$	✓ equation of f / *vergelyking van f* ✓ $x = 0$ ✓ $y = 2$	(3)
5.4.1	$x = 2\ and/en - 2$	✓ $x = -2$ ✓ $x = 2$	(2)
5.4.2	$x \in [-2; 0)$ **OR/*OF*** $-2 \leq x < 0$	✓✓ $[-2; 0)$ ✓✓ $-2 \leq x < 0$	(2) (2)
			[16]

QUESTION/*VRAAG* 6			
6.1		✓ asymptote/ *asimptote* ✓✓ points of intersection/ *snypunte* ✓ shape of g/*vorm van g* ✓ shape of h/*vorm van h* ✓ f through origin / *deur oorsprong*	(6)
6.2	$(0{,}5;\ 0{,}75)$ **OR/*OF*** $(\frac{1}{2}\ ;\ \frac{3}{4})$	✓ $0{,}5$ / $\frac{1}{2}$ ✓ $0{,}75$ / $\frac{3}{4}$ accept/*aanvaar* $x \in (0{,}25;\ 0{,}5)$ / $(\frac{1}{4}\ ;\ \frac{1}{2})$ $y \in (0{,}5;\ 0{,}8)$ / $(\frac{1}{2}\ ;\ \frac{4}{5})$	(2)
6.3	$y > -1$ **OR/*OF*** $y \in (-1\ ;\ \infty)$ **OR/*OF*** $y \neq -1, y \in \mathbb{R}$	✓ answer/*antwoord* ✓ answer/*antwoord* ✓ answer/*antwoord*	(1) (1) (1)
6.4	$x \in (-\infty;\ \infty)$ **OR/*OF*** $x \in \mathbb{R}$	✓✓ answer/ *antwoord* ✓✓ answer/ *antwoord*	(2) (2)
6.5	$x = -1$ $y = 0$	✓✓ answer/ *antwoord*	(2)
6.6	$x \in (-\infty;\ -2)$ **OR/*OF*** $x < -2$	✓✓ answer/ *antwoord* ✓✓ answer/ *antwoord*	(2) (2)
			[15]

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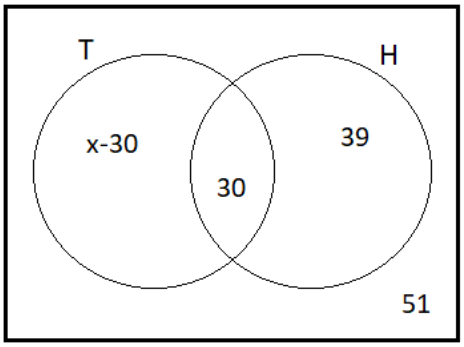
QUESTION/*VRAAG* 7			
7.1.1	$P(S) + P(T) = 1$	✓ answer/*antwoord*	(1)
7.1.2	$P(T) = P(S') = 0{,}33$	✓ answer/*antwoord*	(1)
7.2.1		✓ 30 (intersection/ *deursnee*) ✓ 39 (H only/ *alleenlik*) ✓ $x - 30$ (T only/*alleenlik*) ✓ 51 (outside/ *buitekant*)	(4)
7.2.2	$x - 30 + 30 + 39 + 51 = 180$ $x + 90 = 180$ $\therefore \quad x = 90$ TB only: $90 - 30$ TB alleenlik $= 60$	✓ equation/ *vergelyking* ✓ value of/*waarde van x* ✓ answer/*antwoord*	(3)
7.2.3	(a) $P(T\ only) = \frac{60}{180}$ P(T alleenlik) $= \frac{1}{3}\ or/of\ 0{,}33$ (b) $P(\text{no disease}/geen\ siekte) = \frac{51}{180}$	✓ substitution of 60/*vervanging met 60* ✓ answer/*antwoord* ✓ answer/*antwoord*	(2) (1)
			[12]
		TOTAL/TOTAAL:	**100**

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