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education

Department of
Education
FREE STATE PROVINCE

PREPARATORY EXAMINATION

GRADE 12

MATHEMATICS P1

SEPTEMBER 2023

Gr 12 MATHEMATICS P1



12611B

TIME: 3 HOURS

Stanmorephysics

MARKS: 150

This question paper consists of 9 pages and 1 information sheet.

X10



P2

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Please turn over

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. The question paper consists of 10 questions.
2. Answer ALL the questions.
3. Number your answers correctly according to the numbering system used in this question paper.
4. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answers.
5. Answer only will NOT necessarily be awarded full marks.
6. An approved scientific calculator (non-programmable, non-graphic) may be used, unless stated otherwise.
7. If necessary, round off answers to TWO decimal places, unless stated otherwise.
8. Diagrams are NOT necessarily drawn to scale.
9. An information sheet with formulae is included at the end of the question paper.
10. Write neatly and legibly.



QUESTION 1

1.1 Solve for x :

1.1.1 $(x-1)(2x+1)=0$. (2)

1.1.2 $(x-1)(2x+1)=4$ (correct to two decimal places) (4)

1.1.3 $x+\sqrt{x-2}=4$ (5)

1.1.4 $3x^2+x\leq 0$ (3)

1.2 Solve for x and y in the following simultaneous equations:

$xy=8$ and $2x+y=17$ (6)

1.3 Simplify the following WITHOUT USING A CALCULATOR :

$\sqrt{\sqrt{21x^2}-\sqrt{5x^2}}\times\sqrt{\sqrt{21x^2}+\sqrt{5x^2}}$ (3)
[23]

QUESTION 2

2.1 Consider the series: $a+(a+d)+(a+2d)+\dots$

2.1.1 Prove that the sum of the first n terms of this arithmetic series will be $S_n=\frac{n}{2}[2a+(n-1)d]$. (3)

2.1.2 Given: $2^x+2.2^x+3.2^x+\dots$ The sum of the first 20 terms of the series is 1680. Calculate the value of x . (4)

2.2 Given: $S_n=\frac{n^2+n}{4}$, calculate T_8 . (3)

2.3 Consider the series: $32+(-16)+8+(-4)+\dots$
 Calculate the sum of the first 10 terms of the series. (3)
[13]



QUESTION 3

3.1 Given the quadratic number pattern $-4; -6; -10; -16; \dots$

3.1.1 Determine T_n . (4)

3.1.2 Between which consecutive terms of the pattern is the difference -100 ? (4)

3.2 Given that $\sum_{n=1}^{\infty} \left(k - \frac{3}{2}\right)^n = -\frac{5}{3}$. Calculate the value of k . (4)

[12]

QUESTION 4

Given the function: $h(x) = -\frac{2}{x-2} + 2$.

4.1 Write down the equations of the asymptotes of h . (2)

4.2 Calculate the x -intercept of h . (2)

4.3 Draw the graph of h . Clearly show all asymptotes and intercepts with the axes. (4)

4.4 Determine the equation of the axis of symmetry of h , in the form $y = mx + c$, where $m < 0$. (3)

4.5 Determine the range of $-h(x) + 1$ (2)

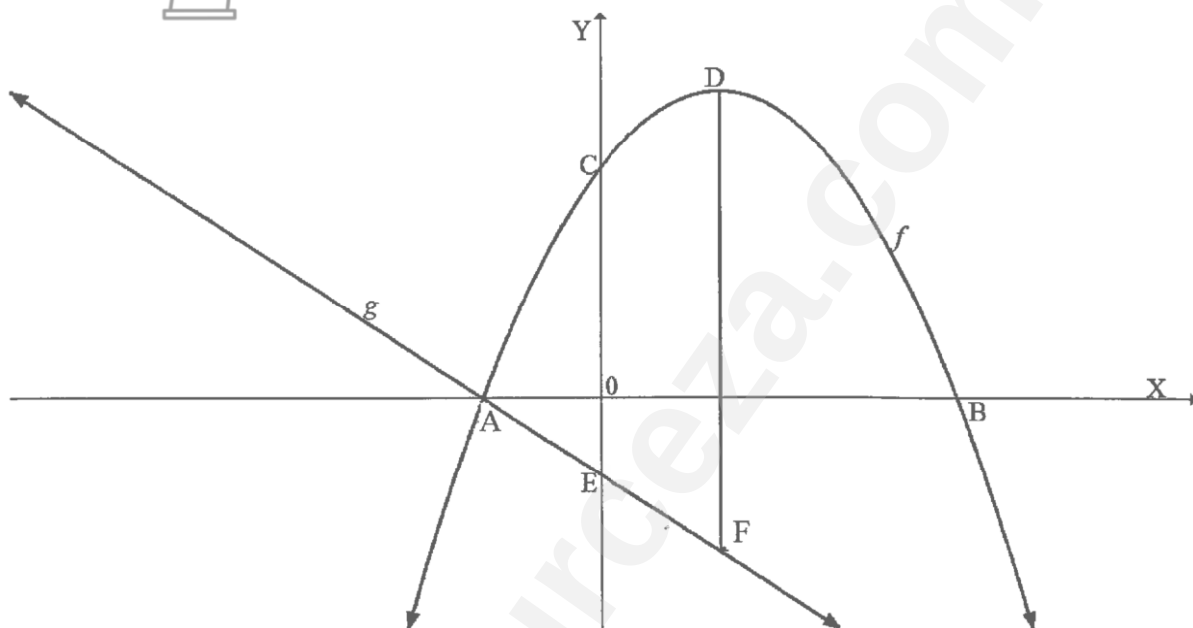
4.6 Determine the values of x where $h(x) \leq 0$. (2)

[15]



QUESTION 5

In the diagram, the graphs of $f(x) = -\frac{1}{2}x^2 + 2x + 6$ and $g(x) = -x - 2$ are drawn. C and E are the y -intercepts of f and g , respectively. The parabola has a turning point at D and cuts the x -axis at A and B. A is also the x -intercept of g . DF is a line parallel to the y -axis with F a point on g .

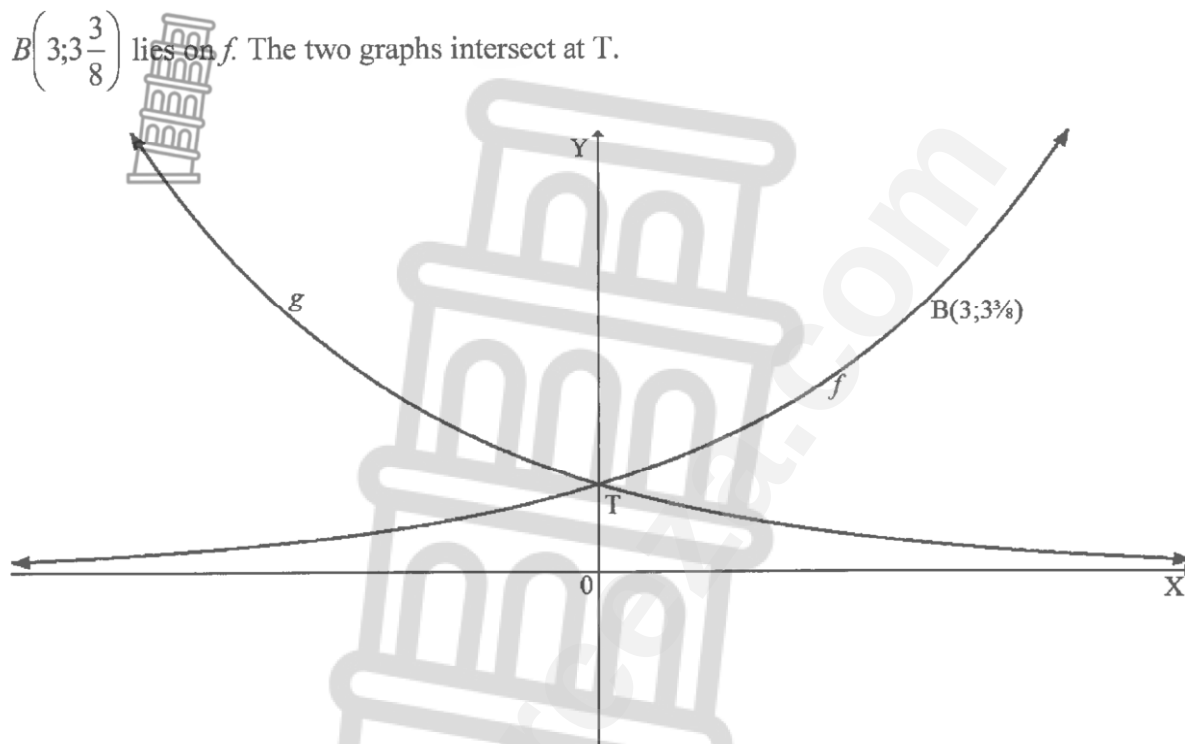


- 5.1 Calculate the:
- 5.1.1 Coordinates of D. (3)
 - 5.1.2 Distance DF. (3)
- 5.2 For which values of k will $f(x) = k$ have two positive roots? (2)
- 5.3 Given that $f(x) = h'(x)$. Determine the x -coordinates of the turning points of h . (3)
- 5.4 Determine the value(s) of x where $f'(x) \times g(x) \leq 0$. (2)
- [13]**

QUESTION 6

The diagram shows the graphs of $f(x) = a^x$ and g , the reflection of f in the y -axis.

$B\left(3;3\frac{3}{8}\right)$ lies on f . The two graphs intersect at T .



- 6.1 Write down the coordinates of T . (1)
- 6.2 Calculate the value of a . (2)
- 6.3 Determine the equation of g . (2)
- 6.4 Write down the equation of $f^{-1}(x)$, the inverse of f , in the form $y = \dots$ (2)
- 6.5 For which values of x will $f^{-1}(x) \leq 1$? (3)

[10]

QUESTION 7

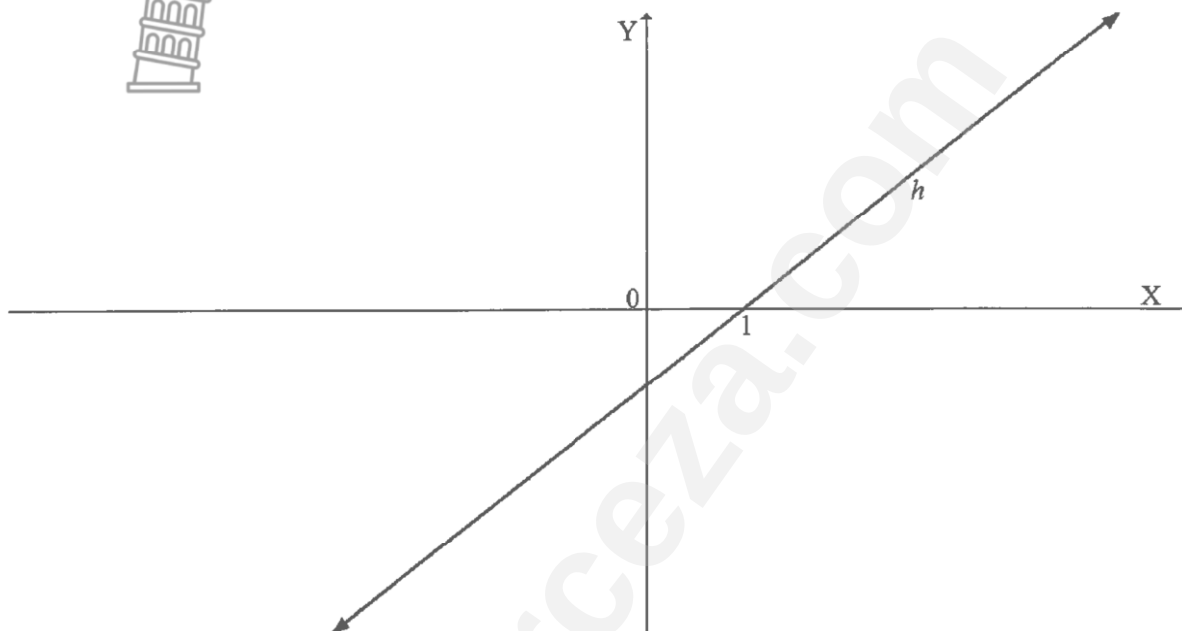
- 7.1 How many years will it take to triple an investment if the interest is compounded annually at a rate of 9,8% p.a.? (3)
- 7.2 Andile needs R64 000 for a holiday. He started to invest a fixed amount of his salary at a rate of 8,5% p.a. compounded monthly, at the end of each month, for ten years.
- 7.2.1 Calculate the monthly payment he will have to make to achieve this. (3)
- 7.2.2 If Andile has stopped his payment at the end of eight years, what will the total of his investment be at the end of ten years? (3)
- 7.3 Madri took out a loan of R400 000 at an interest rate of 10,4% p.a. compounded monthly. She repaid the loan at the end of the first month and every month for 15 years. Her monthly instalment is R4 396,83.
- 7.3.1 Calculate the outstanding balance after nine years. (3)
- 7.3.2 How much interest did she pay over the nine years? (3)
- [15]

QUESTION 8

- 8.1 Determine the derivative of $f(x) = 3 - x^2$ using FIRST PRINCIPLES. (5)
- 8.2 Determine:
- 8.2.1 $D_x \left[\frac{2}{x} - \sqrt{x} \right]$ (4)
- 8.2.2 $\frac{dy}{dx}$, if $y = (x^3 - 1)^2$ (3)
- 8.3 Given: $f(x) = x^3 - 12x - 16$
- 8.3.1 Calculate the:
- (a) Coordinates of the turning points of f . (5)
- (b) x -intercepts of f . (3)
- 8.3.2 $y = 15x + p$ is a tangent to the graph of f . Calculate the x -coordinates of the point(s) of contact. (4)
- 8.3.3 For which value(s) of x will the given function be concave up? (3)
- [27]

QUESTION 9

- 9.1 The diagram shows the straight-line h , where $h(x) = f'(x)$.
The x -intercept of h is 1.
The following is true for function f : $f(1) = -3$ and $f(3) = 0$.



Draw a sketch graph of the function f , clearly indicating all x -intercepts and turning point(s). (3)

- 9.2 During an experiment the temperature, T in $^{\circ}\text{C}$ varies with time t in seconds, to the equation $T(t) = 60 + 27t - t^3$, $t \in [0;6]$.

Calculate:

- 9.2.1 The average change of temperature between 3 and 6 seconds. (3)

- 9.2.2 After how many seconds the temperature will be a maximum. (3)
[9]



QUESTION 10

10.1 Given: $P(A) = 0,4$ and $P(B) = 0,5$

10.1.1 Calculate $P(A \text{ or } B)$ if A and B are mutually exclusive events. (2)

10.1.2 Calculate $P(A \text{ or } B)$ if A and B are independent events. (3)

10.2 A four-digit code must be set using the letters A, E, I, O, U and digits 0 to 9.
The letters may be repeated, but the digits may not be repeated.
The code must consist of two letters and two digits in that order, for example, UO19.

10.2.1 How many different codes are possible with the information given? (4)

10.2.2 What is the probability that a code that is picked randomly will start
with an A and be an even number? (4)

[13]

TOTAL: 150



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INFORMATION SHEET

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

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

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

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

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

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

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

$$y = mx + c$$

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

In $\triangle ABC$:

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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

$$m = \tan \theta$$

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

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

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

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

$$P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

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





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**PREPARATORY EXAMINATION
VOORBEREIDENDE EKSAMEN**

GRADE/GRAAD 12

**MATHEMATICS P1
WISKUNDE V1**

SEPTEMBER 2023

MARKS/PUNTE: 150

**MARKING GUIDELINES
NASIENRIGLYNE**

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



NOTE:

- Constant accuracy applies in the whole marking guideline.
- If a learner answers a question twice, mark only the first attempt.
- If a learner cancels a question, but does not redo it, mark that attempt.

NOTA:

- *Volgehoue akkuraatheid word in ALLE aspekte van die nasienriglyne toegepas.*
- *As 'n kandidaat 'n vraag TWEE KEER beantwoord, sien slegs die EERSTE poging na.*
- *As 'n kandidaat 'n antwoord van 'n vraag doodtrek en nie oordoen nie, sien die doodgetrekte poging na.*



QUESTION/VRAAG 1

1.1		
1.1.1	 $(x - 1)(2x + 1) = 0$ $x = 1 \quad \text{or/of} \quad x = -\frac{1}{2}$	$\checkmark x = 1$ $\checkmark x = -\frac{1}{2}$ (2)
1.1.2	$(x - 1)(2x + 1) = 4$ $2x^2 - x - 5 = 0$ $\therefore x = \frac{-(-1) \pm \sqrt{(-1)^2 - 4(2)(-5)}}{2(2)}$ $x = \frac{1 \pm \sqrt{41}}{4}$ $x = 1,85 \quad \text{or/of} \quad x = -1,35$	$\checkmark$ standard form $\checkmark$ correct substitution in correct formula $\checkmark$ 1,85 $\checkmark$ -1,35 Penalise/mark -1 for incorrect rounding (4)
1.1.3	$x + \sqrt{x - 2} = 4$ $\sqrt{x - 2} = 4 - x$ $(\sqrt{x - 2})^2 = (4 - x)^2$ $x - 2 = 16 - 8x + x^2$ $0 = x^2 - 9x + 18$ $0 = (x - 6)(x - 3)$ $x = 6 \quad \text{or/of} \quad x = 3$ Not applicable/Nie van toepassing nie	$\checkmark$ isolate the surd $\checkmark$ squaring both sides $\checkmark$ standard form $\checkmark$ factors $\checkmark$ answer with choice (5)
1.1.4	$3x^2 + x \leq 0$ $x(3x + 1) \leq 0$ $\text{Critical values: } 0 \text{ and/en } -\frac{1}{3}$ $x \in \left[-\frac{1}{3}; 0\right] \quad \text{Or} \quad -\frac{1}{3} \leq x \leq 0$	$\checkmark$ factors $\checkmark$ critical values $\checkmark$ answer  (3)

1.2 	$2x + y = 17$ $\therefore y = 17 - 2x$ Substitute in/verv. in $xy = 8$ $x(17 - 2x) = 8$ $0 = 2x^2 - 17x + 8$ $0 = (2x - 1)(x - 8)$ $\therefore x = \frac{1}{2} \text{ or } x = 8$ $y = 17 - 2\left(\frac{1}{2}\right) \quad \text{or/of} \quad y = 17 - 2(8)$ $y = 16 \quad \quad \quad y = 1$ OR/OF $x = \frac{17 - y}{2}$ Substitute in/verv. in $xy = 8$ $\left(\frac{17 - y}{2}\right)y = 8$ $17y - y^2 = 16$ $0 = y^2 - 17y + 16$ $0 = (y - 16)(y - 1)$ $\therefore y = 16 \text{ or/of } y = 1$ $x = \frac{17 - 16}{2} \quad \text{or/of} \quad x = \frac{17 - 1}{2}$ $x = \frac{1}{2} \quad \quad \quad x = 8$	✓ $y = 17 - 2x$ ✓ substitution ✓ standard form ✓ factors ✓ both answers for x ✓ both answers for y OR $x = \frac{17 - y}{2}$ ✓ substitution ✓ standard form ✓ factors ✓ both answers for x ✓ both answers for y (6)
1.3	$\sqrt{\sqrt{21x^2} - \sqrt{5x^2}} \times \sqrt{\sqrt{21x^2} + \sqrt{5x^2}}$ $= \sqrt{(\sqrt{21x^2} - \sqrt{5x^2})(\sqrt{21x^2} + \sqrt{5x^2})}$ $= \sqrt{21x^2 - 5x^2}$ $= \sqrt{16x^2}$ $= 4x$	✓ one square root ✓ difference between squares ✓ answer (3) 
		[23]

QUESTION/VRAAG 2

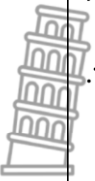
2.1.1	$S_n = a + (a + d) + (a + 2d) + \dots + a + (n-1)d$ $S_n = a + (n-1)d + a + (n-2)d + \dots + a$ $\therefore 2S_n = n(2a + (n-1)d)$ $S_n = \frac{n}{2}(2a + (n-1)d)$ 	$\checkmark T_n = a + (n-1)d$ $\checkmark$ reverse $\checkmark$ add (3)
2.1.2	$2^x + 2.2^x + 3.2^x + \dots$ $\therefore a = 2^x$ $d = 2^x$ $1680 = \frac{20}{2}(2(2^x) + (19)(2^x))$ $168 = 21.2^x$ $8 = 2^x$ $x = 3$	$\left. \begin{array}{l} \text{value } a \\ \text{value } d \end{array} \right\} \checkmark$ $\checkmark$ substitution in correct formula $\checkmark$ Simplification ($8 = 2^x$) $\checkmark$ answer (4)
2.2	$S_n = \frac{n^2 + n}{4}$ $\therefore T_8 = S_8 - S_7$ $= \frac{8^2 + 8}{4} - \frac{7^2 + 7}{4}$ $= 18 - 14$ $= 4$	$\checkmark$ correct method $\checkmark$ substitution $\checkmark$ answer (3)
2.3	$S_n = \frac{a(1 - r^n)}{1 - r}$ $S_{10} = \frac{32 \left(1 - \left(-\frac{1}{2} \right)^{10} \right)}{1 - \left(-\frac{1}{2} \right)}$ $S_{10} = \frac{341}{16} \text{ or/of } 21,31$	$\checkmark$ values of a and r $\checkmark$ substitution into correct formula $\checkmark$ answer  (3)
		[13]



QUESTION/VRAAG 3

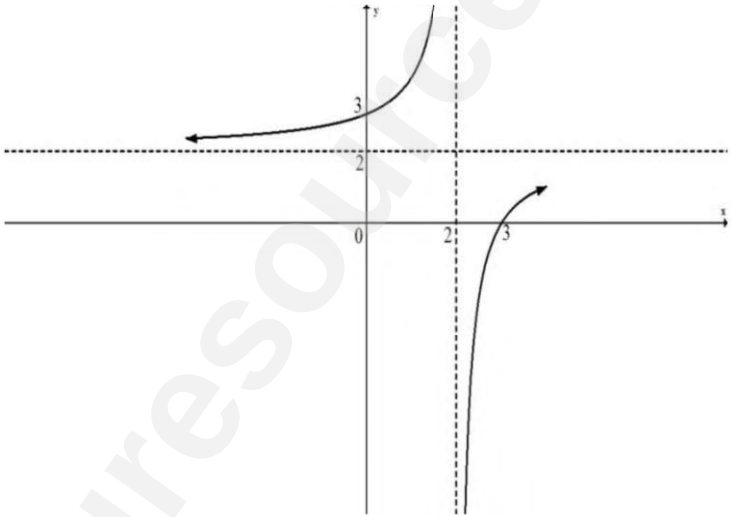
3.1	-4 ; -6 ; -10 ; -16 ; ... given/gegee	
3.1.1	 First difference/eerste verskil : -2 ; -4 ; -6 Second differences/tweede verskil -2 ; -2 $2a = -2 \quad 3(-1) + b = -2$ $a = -1 \quad b = 1$ $-1 + 1 + c = -4$ $c = -4$ $T_n = -n^2 + n - 4$	✓ value of a ✓ value of b ✓ value of c ✓ $T_n = -n^2 + n - 4$ (4) ANSWER ONLY FULL MARKS
3.1.2	$T_n = -2 + (n-1)(-2)$ $T_n = -2n$ $-100 = -2n$ $\therefore n = 50$ Between/tussen T_{50} and/en T_{51} OR/OF $T_{n+1} - T_n = -100$ $-(n+1)^2 + (n+1) - 4 - [-n^2 + n - 4] = -100$ $-n^2 - 2n - 1 + n + 1 - 4 + n^2 - n + 4 = -100$ $-2n = -100$ $n = 50$ Between/tussen T_{50} and/en T_{51}	✓ $d = -2$ ✓ $T_n = -2n$ ✓ 50 ✓ answer OR ✓ $T_{n+1} - T_n = -100$ ✓ substitution ✓ 50 ✓ answer (4)



3.2	 $a = k - \frac{3}{2}$ $r = k - \frac{3}{2}$ $\therefore S_{\infty} = \frac{a}{1-r}$ $-\frac{5}{3} = \frac{k - \frac{3}{2}}{1 - \left(k - \frac{3}{2}\right)}$ $-\frac{5}{3} + \frac{5}{3}k - \frac{5}{2} = k - \frac{3}{2}$ $-10 + 10k - 15 = 6k - 9$ $4k = 16$ $k = 4$	✓ value of a and r ✓ substitution in correct formula ✓ simplification shown ✓ answer (4)
		[12]



QUESTION/VRAAG 4

	Given/gegee $h(x) = -\frac{2}{x-2} + 2$	
4.1	$x = 2$ $y = 2$	✓ $x = 2$ ✓ $y = 2$ (2)
4.2	$0 = -\frac{2}{x-2} + 2$ $-2(x-2) = -2$ $x-2 = 1$ $x = 3$	✓ $y = 0$ ✓ $x = 3$ (2)
4.3		✓ BOTH asymptotes ✓ x- intercept ✓ y- intercept ✓ shape (4)
4.4	$y - 2 = -1(x - 2)$ $y = -x + 4$	✓ gradient -1 ✓ substitute (2; 2) ✓ equation (3)

4.5	$-h(x) + 1$ $= \frac{2}{x-2} - 2 + 1$ $= \frac{2}{x-2} - 1$ $\therefore y \in R; y \neq -1$	✓ new equation ✓ answer (2) ANSWER ONLY FULL MARKS
4.6	$h(x) \leq 0$ $\therefore x \in (2;3]$ OR/OR $2 < x \leq 3$	✓ critical values ✓ notation (2)
		[15]



QUESTION/VRAAG 5

	 Given/gegee $f(x) = -\frac{1}{2}x^2 + 2x + 6$ $g(x) = -x - 2$	
5.1.1	$x = \frac{-2}{2\left(-\frac{1}{2}\right)}$ $x = 2$ $\therefore D(2;8)$ $f'(x) = 0$ $0 = -x + 2$ $x = 2$ OR/OF $y = -\frac{1}{2}(x^2 - 4x) + 6$ $y = -\frac{1}{2}(x - 2)^2 + 8$ $\therefore D(2;8)$	✓ method for turning point ✓ x-value ✓ y-value (3)
5.1.2	$D(2;8)$ $\therefore F(2;-4)$ $DF = 12 \text{ units/eenhede}$	✓✓ coordinates F ✓ answer (3)
5.2	$6 < k < 8$	✓✓ answer (2)
5.3	$h'(x) = f(x)$ $0 = -\frac{1}{2}x^2 + 2x + 6$ $0 = x^2 - 4x - 12$ $0 = (x - 6)(x + 2)$ $A(-2;0)$ $B(6;0)$ $\therefore x = -2$ $x = 6$ for turning points of/vir draaipunte van h	✓ $f(x) = h'(x) = 0$ ✓ Factors ✓ both x values (3)
5.4	$f'(x) \times g(x) \leq 0$ $\therefore x \in [-2;2]$	✓ critical values ✓ notation  (2)
		[13]

QUESTION/VRAAG 6

6.1	 $T(0; 1)$	✓ answer (1)
6.2	 $\frac{27}{8} = a^3$ $\therefore a = \frac{3}{2}$	✓ substitute B ✓ answer (2)
6.3	$g(x) = \left(\frac{2}{3}\right)^x$ OR/OF $g(x) = \left(\frac{3}{2}\right)^{-x}$	✓ base ✓ exponent (2)
6.4	$f^{-1} : x = \left(\frac{3}{2}\right)^y$ $\therefore y = \log_{\frac{3}{2}} x$	✓ swop x and y ✓ answer (2)
6.5	$\log_{\frac{3}{2}} x = 1$ $\therefore x = \frac{3}{2}$ $f^{-1}(x) \leq 1$ $\therefore x \in (0; \frac{3}{2}]$	✓ $x = \frac{3}{2}$ ✓ critical values ✓ notation (3)
		[10]



QUESTION/VRAAG 7

7.1	 $A = P(1+i)^n$ $3x = x(1+0,098)^n$ $3 = 1,098^n$ $n = \log_{1,098} 3$ $n = 11,751$ It will take 12 years to triple the money/Dit sal 12 jaar neem om die geld te verdriedubbel.	✓ correct substitution in correct formula ✓ use of logs (independent mark) ✓ 12 also accept 11,75 (3)
7.2		
7.2.1	$F_v = \frac{x[(1+i)^n - 1]}{i}$ $64000 = \frac{x \left[\left(1 + \frac{0,085}{12} \right)^{120} - 1 \right]}{\frac{0,085}{12}}$ $x = 340,18$	✓ $i = \frac{0,085}{12}$ $n = 120$ both i and n ✓ substitution in correct formula ✓ answer (3)
7.2.2	$F_v = \frac{340,18 \left[\left(1 + \frac{0,085}{12} \right)^{96} - 1 \right]}{\frac{0,085}{12}} \left(1 + \frac{0,085}{12} \right)^{24}$ $= 55135,69$	✓ $96 = n$ ✓ compound interest 24 months ✓ answer (3)
7.3		
7.3.1	$P_v = \frac{4396,83 \left[1 - \left(1 + \frac{0,104}{12} \right)^{-72} \right]}{\frac{0,104}{12}}$ $= R234770,75$	✓ $72 = n$ and $i = \frac{0,104}{12}$ ✓ substitution into correct formula ✓ answer 

	ALTERNATIVE method <i>ALTERNATIEWE metode</i>  $400000 \left(1 + \frac{0,104}{12} \right)^{108}$ $- \frac{4396,83 \left[\left(1 + \frac{0,104}{12} \right)^{108} - 1 \right]}{\frac{0,104}{12}}$ $= R234770,77$	✓ loan with $n = 108$ ✓ F_v with $n = 108$ ✓ answer (3)
7.3.2	During 9 years, she paid R474 857,64. Her payment on the loan however is only R165 229,25. She paid interest of R309 628,39 over the 9 years. / <i>Gedurende 9 jaar het sy R474 857,64 betaal. Haar betaling op die lening is egter slegs R165 229,25. Sy het rente van R309 628,39 oor die 9 jaar betaal</i>	✓ R474 857,64 ✓ R165 229,25 or R165 229,23 ✓ R309 628,39 or R306 628,41 (3)
		[15]



QUESTION/VRAAG 8

Penalise 1 mark for incorrect notation in question 8

only/ Penaliseer slegs 1 punt vir verkeerde notasie in vraag 8.

8.1 	$f(x) = 3 - x^2$ $f(x+h) = 3 - (x+h)^2$ $= 3 - x^2 - 2xh - h^2$ $f'(x) = \lim_{h \rightarrow 0} \frac{f(x+h) - f(x)}{h}$ $= \lim_{h \rightarrow 0} \frac{3 - x^2 - 2xh - h^2 - (3 - x^2)}{h}$ $= \lim_{h \rightarrow 0} \frac{-2xh - h^2}{h}$ $= \lim_{h \rightarrow 0} \frac{h(-2x - h)}{h}$ $= \lim_{h \rightarrow 0} (-2x - h)$ $= -2x$	$\checkmark = 3 - x^2 - 2xh - h^2$ $\checkmark \text{ substitution in correct formula}$ $\checkmark \text{ simplify}$ $\checkmark \text{ factors}$ $\checkmark \text{ answer}$ (5)
8.2	8.2.1 $D_x \left[\frac{2}{x} - \sqrt{x} \right]$ $= D_x \left[2x^{-1} - x^{\frac{1}{2}} \right]$ $= -2x^{-2} - \frac{1}{2}x^{-\frac{1}{2}}$	$\checkmark 2x^{-1}$ $\checkmark x^{\frac{1}{2}}$ $\checkmark -2x^{-2}$ $\checkmark -\frac{1}{2}x^{-\frac{1}{2}}$ (4)
8.2.2	$y = (x^3 - 1)^2$ $y = x^6 - 2x^3 + 1$ $\therefore \frac{dy}{dx} = 6x^5 - 6x^2$	$\checkmark x^6 - 2x^3 + 1$ $\checkmark 6x^5$ $\checkmark -6x^2$  (3)

8.3	$f(x) = x^3 - 12x - 16$	
8.3.1(a)	 $f'(x) = 3x^2 - 12$ $0 = 3(x - 2)(x + 2)$ $x = 2$ $x = -2$ $\therefore (2; -32)$ $(-2; 0)$	$\checkmark 3x^2 - 12$ $\checkmark = 0$ $\checkmark$ factors $\checkmark (2; -32)$ $\checkmark (-2; 0)$ (5)
8.3.1(b)	$x^3 - 12x - 16 = 0$ $(x + 2)(x + 2)(x - 4) = 0$ $x = -2$ $x = 4$	$\checkmark y = 0$ $\checkmark$ factors $\checkmark$ BOTH answers (3)
8.3.2	$15 = 3x^2 - 12$ $0 = 3x^2 - 27$ $x^2 = 9$ $x = \pm 3$	$\checkmark$ derivative = 15 $\checkmark$ standard form $\checkmark x = 3$ $\checkmark x = -3$ (4)
8.3.3	$f''(x) = 6x$ $0 = 6x$ $x = 0$ Concave up/ <i>konkaaf op</i> : $x \in (0; \infty)$ or written/of <i>geskryf</i> as $x > 0$	$\checkmark 6x = 0$ $\checkmark$ values $\checkmark$ notation (3)
		[27]



QUESTION/VRAAG 9



QUESTION/VRAAG 10

10.1	 $P(A) = 0,4$ $P(B) = 0,5$	
10.1.1	$P(A \text{ or/of } B) = P(A) + P(B)$ $- P(A \text{ and/en } B)$ $= 0,4 + 0,5 - 0$ $= 0,9$	$\checkmark P(A \text{ and } B) = 0$ $\checkmark$ answer (2)
10.1.2	$P(A \text{ or/of } B) = P(A) + P(B)$ $- P(A \text{ and/en } B)$ $= 0,4 + 0,5 - (0,4 \times 0,5)$ $= 0,7$	$\checkmark$ rule $\checkmark P(A) \times P(B) = P(A \text{ and } B)$ $\checkmark$ answer (3)
10.2		
10.2.1	$5 \times 5 \times 10 \times 9$ $= 2250$	$\checkmark$ 5 $\checkmark$ 5 $\checkmark$ 10 $\checkmark$ 9 (4)
10.2.2	$\frac{1 \times 5 \times 9 \times 5}{2250}$ $= \frac{1}{10}$ $= 0,1$	$\checkmark$ denominator 2250 $\checkmark$ 1×5 $\checkmark$ 9×5 $\checkmark$ answer (4)
		[13]

 **TOTAL/TOTAAL: 150**