Province of the EASTERN CAPE
EDUCATION

NATIONAL
SENIOR CERTIFICATE

GRADE 12

JUNE 2021

MATHEMATICS P1
(EXEMPLAR)

MARKS: 150

TIME: 3 hours

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1.   This question paper consists of 11 questions. Answer ALL the questions.

2.   Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answers.

3.   Answers only will NOT necessarily be awarded full marks.

4.   You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.

5.   If necessary, round off answers to TWO decimal places, unless stated otherwise.

6.   Diagrams are NOT necessarily drawn to scale.

7.   An information sheet, with formulae, is included at the end of the question paper.

8.   Number the answers correctly according to the numbering system used in this question paper.

9.   Write neatly and legibly.

QUESTION 1

1.1 Solve for x, in each of the following:

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

     1.1.2 $2x(x-3)=1$ (correct to TWO decimal places)   (4)

     1.1.3 $x^2 - 2x - 15 \leq 0$ (3)

     1.1.4 $x = \left(\sqrt{3+a-2\sqrt{a}}\right)^2 - \left(\sqrt{a}-1\right)^2$ (3)

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

$$x - 2y = 3$$
$$4x^2 - 5xy = 3 - 6y$$
                                                                  (6)

1.3 The equation $3mx^2 - px + 5 = 0$; $m \neq 0$ and $p \neq 0$, has equal roots.

     1.3.1   Show that $f(x) = 3mx^2 - px + 5$ has a minimum value.   (4)

     1.3.2   If it is further given that $p < 0$, draw a sketch graph of $f(x) = 3mx^2 - px + 5$.   (2)

                                                                           [24]

QUESTION 2

2.1 Determine which term of the sequence: $23; 21; 19; \ldots$ is -47.   (2)

2.2 The first three terms of an arithmetic sequence are: $3x - 1$; $x + 5$; $2x - 4$

     2.2.1   Calculate the value of x.   (3)

     2.2.2   Determine the number of terms of which the sum is equal to zero.   (4)

2.3 Given the quadratic pattern: $25 ; 48 ; 69 ; 88 ; x ; y ; \ldots$
     Determine:

     2.3.1   The values of x and y (2)

     2.3.2   The general term, T_n of the quadratic pattern   (4)

     2.3.3   The value of the largest term of this pattern   (3)

2.4 Calculate the value of a, if: $\displaystyle\sum_{k=1}^{3}\left(a \times 2^{k-1}\right) = 28$ (2)

                                                                           [20]

QUESTION 3

A circular disk of radius, R is cut out of paper as shown in the diagram. Two disks of radius, $\frac{1}{2}R$ are cut out of paper and placed on top of the first disk, as shown. Then four disks of

radius, $\frac{1}{4}R$ are cut out of paper and placed on top of the two disks, as shown.
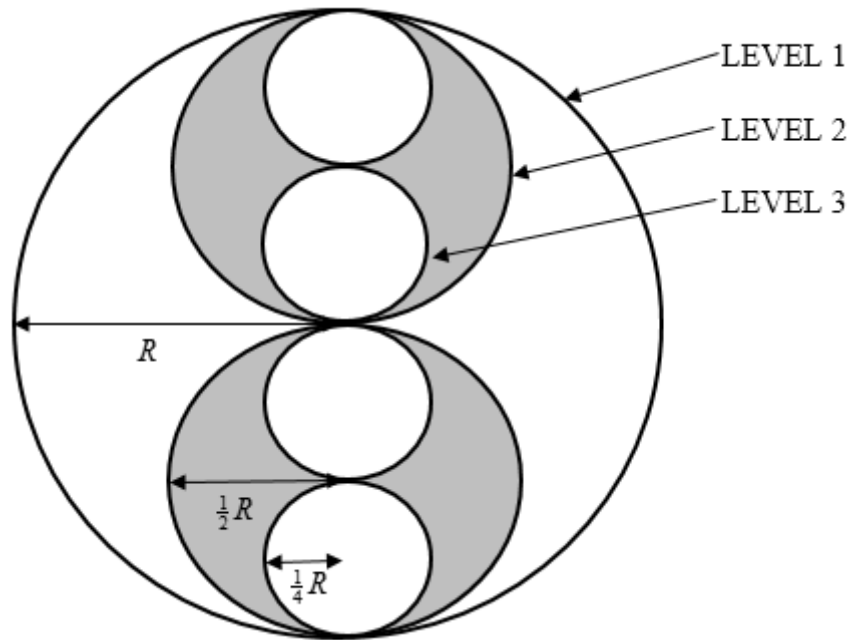

3.1   If this process can be repeated, determine the area of the disks on the fourth level only.   (4)

3.2   Calculate the total area of all the disks, if the process is repeated indefinitely.   (3)

                                                             [7]

QUESTION 4

Given: $f(x) = -x^2 - 4x + 5$ and $g(x) = ax + q$. E, M and P are the intercepts of the graphs with the axes. N is the turning point and NTD the axis of symmetry of f. T is a point on the graph of g and S is the reflection of M about the axis of symmetry.
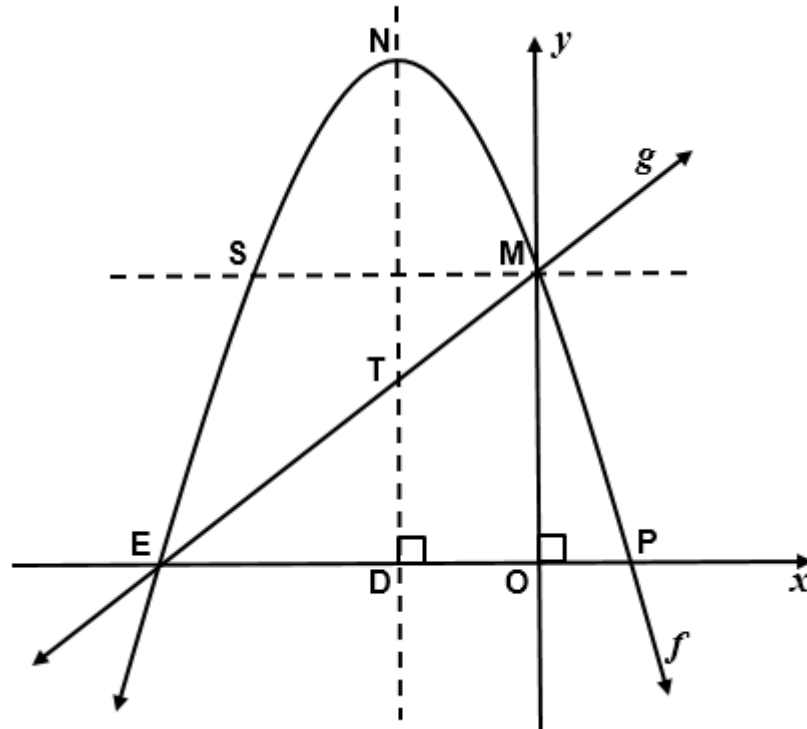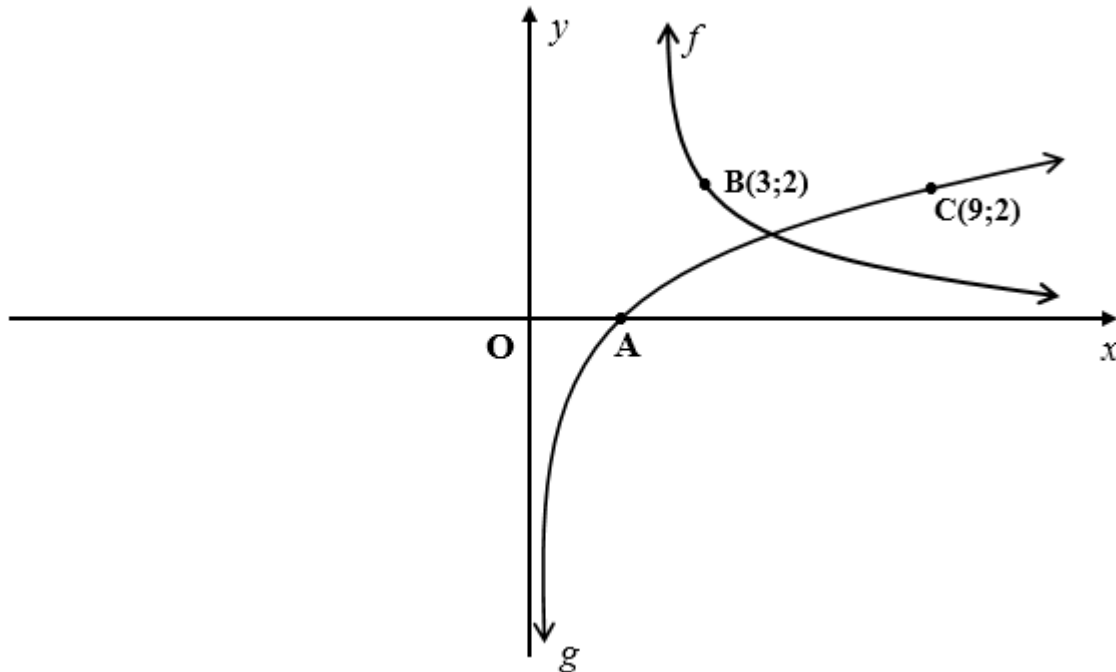

Determine:

4.1   The coordinates of M, E and P   (4)

4.2   The coordinates of N   (3)

4.3   The values of a and q (2)

4.4   The length of NT   (3)

4.5   The equation of the tangent to f at point S   (5)

                                                                   [17]

QUESTION 5

In the figure below, two sketch graphs are shown for: $f(x) = \dfrac{k}{x}$, where $x > 0$ and

$g(x) = \log_p x$

5.1 Write down the coordinates of A. (1)

5.2 Determine the values of k and p. (3)

5.3 Determine the equation of g^{-1} in the form $y = ...$ (2)

5.4 Write down the range of g^{-1}. (2)

5.5 Solve for x if $\dfrac{6}{x} - \log_3 x = 1$ (2)

[10]

QUESTION 6

Given: $g(x) = (x+2)(y+3) = k$; for $k > 0$, is a hyperbola with $g(0) = -\dfrac{5}{2}$. Determine:

6.1 The equations of the asymptotes of g (3)

6.2 The value of k (2)

6.3 The equation of the axis of symmetry of g which has a negative gradient (2)

[7]

QUESTION 7

7.1 Convert a nominal interest rate of 8,9% p.a. compounded monthly to effective interest rate per annum. (3)

7.2 Alan retires and decides to invest R1 000 000 of his retirement lump sum. The bank offers him an interest rate of 12,6% p.a. compounded monthly. How long will it take for his money to double? (4)

7.3 R60 000 is invested in an account which offers interest at 7% p.a. compounded quarterly for the first 18 months. Thereafter the interest rate changes to 5% p.a. compounded monthly. Three years after the initial investment, R5 000 is withdrawn from the account. How much money will be in the account at the end of 5 years? (7)

[14]

QUESTION 8

8.1 Given $f(x) = -7x^2$. Determine $f'(x)$ from first principles. (4)

8.2 Determine $\dfrac{dy}{dx}$ if:

8.2.1 $y = -\dfrac{1}{x^4} + \sqrt{x}$ (3)

8.2.2 $y = \dfrac{x-4}{x^{\frac{1}{2}} - 2}$ (3)

[10]

QUESTION 9

Given: $g(x) = x^3 + x^2 - 16x + 20$

9.1 Show that $(x+5)$ is a factor of $g(x)$. (2)

9.2 Hence, or otherwise determine the *x*-intercepts of g. (3)

9.3 Determine the coordinates of the turning points of *g*. (4)

9.4 Sketch the graph of $g(x)$, showing clearly the intercepts with the axes and the turning points. (3)

9.5 Discuss the concavity of the graph at the *y*-intercept. Support your answer with relevant calculations. (3)

9.6 For which values of *x* will $x.f'(x) \geq 0$? (3)

[18]

QUESTION 10

The total cost of producing x cellphones per day is given by $T = \left(\dfrac{1}{5}x^2 + 15x + 10 \right)$ rand and

each cellphone is sold for a price of $\left(47 - \dfrac{1}{3}x \right)$ rand.

10.1   Determine an expression for money raised from the sale of x cellphones.   (2)

10.2   How many cellphones should be made daily to maximise the profit?   (5)

                                                                                              [7]

QUESTION 11

11.1   Given:
- $P(A) = 0,5$
- $P(A \text{ and } B) = 0,2$
- $P(\text{not } B) = 0,6$

   11.1.1   Determine $P(A \text{ or } B)$ (3)

   11.1.2   Your teacher claims that events A and B are independent. Do you agree or
            disagree? Justify your answer with calculations.   (3)

11.2   A bag contains **five** red and y green marbles.

   11.2.1   What is the probability that a red or a green marble will be drawn from the
            bag?   (1)

   11.2.2   Two marbles are drawn successively without replacement. Represent this
            using a tree diagram. Label all the branches and write down the outcomes.   (4)

   11.2.3   Determine how many green marbles are in the bag if the probability of
            drawing two marbles of the same colour is $\dfrac{31}{66}$.   (5)

                                                                                              [16]

                                                          TOTAL: 150

INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

In △ABC:

$$\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C} \qquad a^2 = b^2 + c^2 - 2bc.\cos A \qquad area \, \triangle ABC = \frac{1}{2}ab.\sin C$$

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

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

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

$$\bar{x} = \frac{\sum x}{n} \qquad \partial^2 = \frac{\sum_{i=1}^{n}(x_i - \bar{x})^2}{n} \qquad P(A) = \frac{n(A)}{n(S)} \quad P(A \text{ or } B) = P(A) + P(B) - P(A \text{ and } B)$$

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

NATIONAL
SENIOR CERTIFICATE/
NASIONALE
SENIOR SERTIFIKAAT

GRADE/*GRAAD* 12

JUNE/*JUNIE* 2021

MATHEMATICS P1/*WISKUNDE V1*
MARKING GUIDELINE/*NASIENRIGLYN*
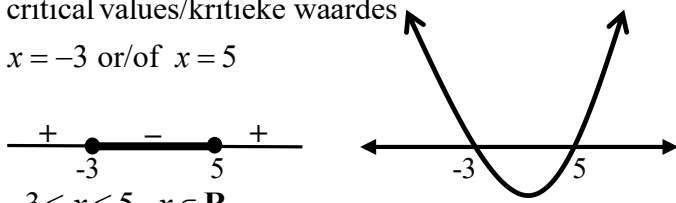# (EXEMPLAR/*EKSEMPLAAR*)
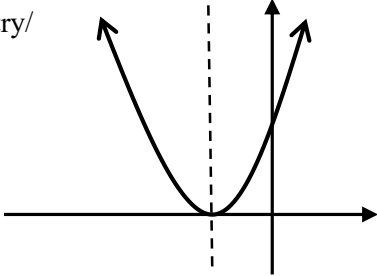
MARKS/*PUNTE:* 150

This marking guideline consists of 14 pages./
Hierdie nasienriglyn bestaan uit 14 bladsye.

NOTE/*LET OP*:

- If a candidate answered a question TWICE, mark the FIRST attempt ONLY.
  Indien 'n kandidaat 'n vraag TWEE keer beantwoord het, merk SLEGS die EERSTE poging.
- Consistent accuracy (CA) applies in ALL aspects of the marking guideline.
  Volgehoue akkuraatheid is op ALLE aspekte van die nasienriglyn van toepassing.
- 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	$2x(x+1) = 0$ $2x = 0$ or/of $x+1 = 0$ $x = 0$ or/of $x = -1$	✓ $x = 0$ ✓ $x = -1$ (2)
1.1.2	$2x(x-3) = 1$ $2x^2 - 6x - 1 = 0$ [Penalise 1 mark for incorrect rounding off./ *Penaliseer 1 punt vir verkeerde afronding.*] $x = \dfrac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \dfrac{-(-6) \pm \sqrt{(-6)^2 - 4(2)(-1)}}{2(2)}$ $x = \dfrac{6 \pm \sqrt{44}}{4}$ $\therefore x = 3,16$ *or / of* $x = -0,16$	✓ standard form / *standaardvorm* ✓ substitution / *vervanging* ✓✓ x-values / *waardes* (4)
1.1.3	$x^2 - 2x - 15 \le 0$ $(x+3)(x-5) \le 0$ critical values/kritieke waardes $x = -3$ or/of $x = 5$ $-3 \le x \le 5,\ x \in \mathbf{R}$ **OR/OF** $x \in \left[-3\,;\,5\right],\ x \in \mathbf{R}$	✓ factors / *faktore* ✓✓ $-3 \le x \le 5$ (accuracy/*akkuraatheid*) **OR/OF** $x \in \left[-3\,;\,5\right]$ (3)

1.1.4	$x = \left(\sqrt{3+a-2\sqrt{a}}\right)^2 - \left(\sqrt{a}-1\right)^2$ $= 3 + a - 2\sqrt{a} - \left(a - 2\sqrt{a} + 1\right)$ $= 3 + a - 2\sqrt{a} - a + 2\sqrt{a} - 1$ $= 2$	✓ $3 + a - 2\sqrt{a}$ ✓ $a - 2\sqrt{a} + 1$ ✓ answer / *antwoord* (3)
1.2	$x - 2y = 3$ ....(1) $4x^2 - 5xy = 3 - 6y$ .....(2) *From / Vanaf* (1): $x = 2y + 3$ .....(3) (3) into (2): $4(2y+3)^2 - 5y(2y+3) = 3 - 6y$ $4(4y^2 + 12y + 9) - 10y^2 - 15y - 3 + 6y = 0$ $16y^2 + 48y + 36 - 10y^2 - 15y - 3 + 6y = 0$ $6y^2 + 39y + 33 = 0$ $\left(6y + 33\right)\left(y + 1\right) = 0$ $y = -\dfrac{33}{6}$ or/of $y = -1$ $y = -\dfrac{11}{2}$ $x = -8$ or/of $x = 1$	 ✓ $x = 2y + 3$ ✓ substitution / *vervanging* ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ y-values / *waardes* ✓ x-values / *waardes* (6)
1.3.1	*For equal roots / Vir gelyke wortels* $\Delta = 0$ $b^2 - 4ac = 0$ $(-p)^2 - 4(3m)(5) = 0$ $p^2 - 60m = 0$ $p^2 = 60m$ $\therefore m > 0 \Rightarrow 3m > 0$ $\therefore$ minimum value/*waarde*	✓ $\Delta = 0$ ✓ substitution and simplification *vervanging en vereenvoudiging* ✓ $p^2 = 60$ m ✓ conclusion / *gevolgtrekking* (4)
1.3.2	Consider axis of symmetry/ *Vir simmetrie-as* $x = \dfrac{-b}{2a} = \dfrac{-(+)}{2(+)} = -ve$ 	✓ method / *metode* ✓ correct sketch / *korrekte skets* (2)
		[24]

QUESTION 2/*VRAAG 2*

2.1	$23 \; ; \; 21 \; ; \; 19 \; ; \; . \; . \; . \; ; \; -47$ $a = 23$ and/en $d = -2$ $T_n = a + (n-1)d$ $-47 = 23 + (n-1)(-2)$ $-47 = 25 - 2n$ $2n = 72$ $n = 36$	✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
2.2.1	$T_2 - T_1 = T_3 - T_2$ $(x+5) - (3x-1) = (2x-4) - (x+5)$ $x + 5 - 3x + 1 = 2x - 4 - x - 5$ $-2x + 6 = x - 9$ $15 = 3x$ $\therefore x = 5$	✓ method / *metode* ✓ substitution / *vervanging* ✓ answer / *antwoord* (3)
2.2.2	$T_1 = 14 \quad ; \quad T_2 = 10 \quad ; \quad T_3 = 6$ $d = -4$ $S_n = \dfrac{n}{2}\big[2a + (n-1)d\big]$ $0 = \dfrac{n}{2}\big[2(14) + (n-1)(-4)\big]$ $0 = \dfrac{n}{2}\big[32 - 4n\big]$ $0 = -2n^2 + 16n$ $0 = -2n(n-8)$ $\therefore n \neq 0 \qquad$ or / *of* $\; n = 8$	✓ first term and common difference / *eerste term en gemene verskil* ✓ substituting S_n, a and d / *vervanging* $S_n,$ *a* en *d* ✓ standard form / *standaardvorm* ✓ answer / *antwoord* (4)
2.3.1	$25 \; ; \; 48 \; ; \; 69 \; ; \; 88 \; ; \; x \; ; \; y$ 1st *difference pattern*/1ste *verskille patroon* : $23 \; ; \; 21 \; ; \; 19 \; ; \; 17 \; ; \; 15...$ $\therefore x = 105$ *and / en* $y = 120$	✓ $x = 105$ ✓ $y = 120$ (2)

2.3.2	$2a = -2$ $\quad 3a + b = 23$ $\quad a + b + c = 25$ $a = -1$ $\quad 3(-1) + b = 23$ $\quad (-1) + (26) + c = 25$ $\quad\quad\quad\quad\quad\quad b = 26$ $\quad\quad\quad\quad\quad c = 0$ $\therefore\ T_n = -n^2 + 26n$	✓ value of *a* / *waarde van a* ✓ value of *b* / *waarde van b* ✓ value of *c* / *waarde van c* ✓ answer / *antwoord* (✓✓✓✓ **can be awarded at formula /** *kan by formule toegeken word*) (4)
2.3.3	$n = \dfrac{-b}{2a}$ $\quad\quad\quad\quad T_{13} = -(13)^2 + 26(13)$ $\quad = \dfrac{-(26)}{2(-1)}$ $\quad\quad\quad = 169$ $\quad = 13$	✓ method / *metode* ✓ $n = 13$ ✓ answer / *antwoord* ($T_{13} = 169$) (3)
2.4	$\displaystyle\sum_{k=1}^{3}\left(a \times 2^{k-1}\right) = 28$ $a + 2a + 4a = 28$ $\quad\quad\quad 7a = 28$ $\quad\quad\quad\ a = 4$ **OR/OF** $S_n = \dfrac{a\left(2^3 - 1\right)}{2 - 1} = 28$ $7a = 28$ $\ a = 4$	✓ expanding / *uitbreiding* ✓ answer / *antwoord* (2) ✓ substitution / *vervanging* ✓ answer / *antwoord* (2)
		[20]

QUESTION 3/*VRAAG 3*

3.1	$A_{level1} = 1 \times \pi R^2$	✓✓✓ Areas for levels 1 to 3
	$A_{level2} = 2 \times \pi \left(\frac{1}{2} R\right)^2 = \frac{1}{2} \pi R^2$	*Oppervlaktes vir vlakke 1 tot 3*
	$A_{level3} = 4 \times \pi \left(\frac{1}{4} R\right)^2 = \frac{1}{4} \pi R^2$	
	$A_{level4} = 8 \times \pi \left(\frac{1}{8} R\right)^2 = \frac{1}{8} \pi R^2 \ / \ 0,39R^2$	✓ answer / *antwoord* (4)
	OR / OF	✓ value of a / *waarde van a*
		✓ value of r / *waarde van r*
	$a = \pi R^2 \quad ; \quad r = \frac{1}{2}$	✓ substitution / *vervanging*
	$T_4 = (\pi R^2)\left(\frac{1}{2}\right)^3 = \frac{1}{8} \pi R^2 \ / \ 0,39R^2$	✓ answer / *antwoord* (4)
	OR / OF	If this option is given:
		As hierdie opsie gegee word:
	$A_{level4} = 8 \times \pi \left(\frac{1}{8} R\right)^2$	✓ 8
	$\quad = \frac{1}{8} \pi R^2 \ / \ 0,39R^2$	✓ $\frac{1}{8} R$
		✓✓ answer / *antwoord*
		(4)
3.2	$S_\infty = \dfrac{a}{1-r}$	✓ formula / *formule*
	$\quad = \dfrac{\pi R^2}{1 - \frac{1}{2}}$	✓ substitution / *vervanging*
	$\quad = 2\pi R^2 \ / \ 6,28R^2$	✓ answer / *antwoord* (3)
		[7]
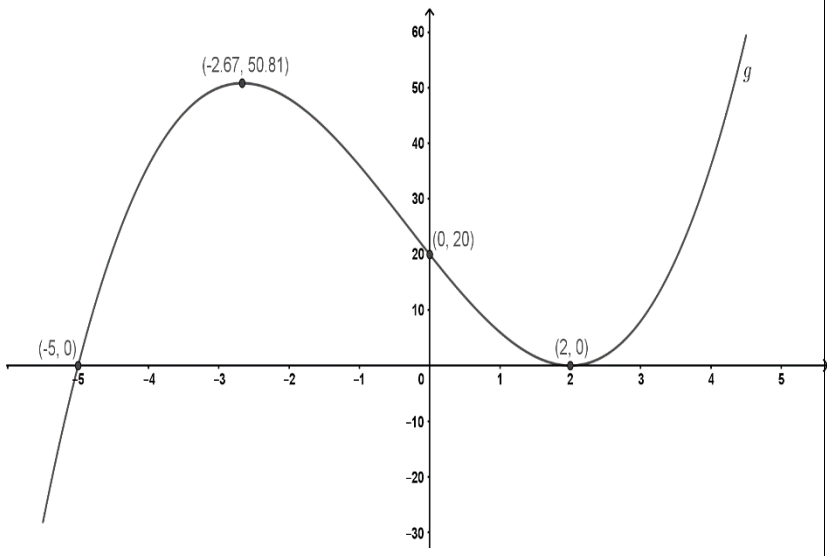
QUESTION 4/*VRAAG 4*

4.1	$-x^2 - 4x + 5 = 0$	
	$x^2 + 4x - 5 = 0$	
	$(x + 5)(x - 1) = 0$	
	$x = -5$ or/of $x = 1$	✓ solving for x-intercepts / *oplossing vir x-afsnitte*
	M(0 ; 5)	✓ M(0 ; 5)
	E(-5 ; 0)	✓ E(-5 ; 0)
	P(1 ; 0)	✓ P(1 ; 0)
		(4)

4.2	$x = \dfrac{(-5+1)}{2} = -2$ or/of $x = \dfrac{-(-4)}{2(-1)} = -2$	✓ x-value / x-*waarde*
	$y = -(-2)^2 - 4(-2) + 5 = 9$	✓ substitution / *vervanging*
	$\therefore N(-2;9)$	✓ y-value / *y-waarde*
		(3)

4.3	$a = 1$ and/*en* $q = 5$	✓ $a = 1$
		✓ $q = 5$ (2)

4.4	Length of ND = 9 / *Lengte van* ND = 9 (from/*vanaf* 4.2)	✓ ND = 9
	$y = x + 5$	
	$= -2 + 5$	
	$= 3$	
	$\therefore$ length of TD = 3 / *Lengte van* TD = 3	✓ TD = 3
	NT = ND – TD	
	$= 9 - 3$	
	$= 6$	✓ NT = 6
		(3)

4.5	S(-4 ; 5)	✓ coordinates of S / *koördinate van S*
	$m = f'(-4)$	✓ $m = f'(-4)$
	$= -2(-4) - 4$	
	$= 4$	✓ $m = 4$
	$y - 5 = 4(x + 4)$	✓ substitution / *vervanging*
	$y = 4x + 21$	✓ answer / *antwoord*
		(5)
		[17]

QUESTION 5/VRAAG 5

5.1	A(1 ; 0)	✓ answer / antwoord (1)
5.2	$f(x) = \dfrac{k}{x}$ $\qquad$ $g(x) = \log_p x$ $2 = \dfrac{k}{3}$ $\qquad\qquad$ $2 = \log_p 9$ $k = 6$ $\qquad\qquad$ $p^2 = 9 \implies p = 3$	✓ $k = 6$ ✓ $p^2 = 9$ ✓ $p = 3$ (3)
5.3	$y = \log_3 x$ $g^{-1} : x = \log_3 y$ $\therefore y = 3^x$ $\boxed{\begin{array}{l}\text{Answer only: Full marks}\\ \textit{Slegs antwoord: Volpunte}\end{array}}$	✓ interchanging x and y omruil van x en y ✓ answer / antwoord (2)
5.4	Range of / Terrein van g^{-1} $y > 0$; $y \in \mathbf{R}$	✓✓ answer / antwoord (2)
5.5	$\dfrac{6}{x} = \log_3 x + 1$ (3 ; 1) will be a point on g / sal 'n punt op g wees $g(x) + 1$ will intersect f at (3 ; 2) / g(x) + 1 sny f by (3 ; 2) $\therefore x = 3$	✓ (3 ; 1) point on g / punt op g ✓ answer / antwoord (2)
		[10]

QUESTION 6/*VRAAG 6*	
6.1	$g(x) = (x+2)(y+3) = k$
	$(y+3) = \dfrac{k}{(x+2)}$
	$y = \dfrac{k}{(x+2)} - 3$ ✓ standard form / *standaardvorm*
	$x = -2$ (vertical asymptote / *vertikale asimptoot*) ✓ $x = -2$
	$y = -3$ (horizontal asymptote / *horisontale asimptoot*) ✓ $y = -3$ (3)
6.2	$-\dfrac{5}{2} = \dfrac{k}{0+2} - 3$ ✓ substitution / *vervanging*
	$\dfrac{1}{2} = \dfrac{k}{2}$ ✓ answer / *antwoord*
	$\therefore k = 1$ (2)
6.3	$y = -(x+2) - 3$ ✓ substitution / *vervanging*
	$y = -x - 5$ ✓ answer / *antwoord* (2)
	[7]

QUESTION 7/*VRAAG 7*	
7.1	$1 + i_{eff} = \left(1 + \dfrac{i_{nom}}{n}\right)^n$ ✓ formula / *formule*
	$i_{eff} = \left(1 + \dfrac{8,9\%}{12}\right)^{12} - 1$ ✓ substitution / *vervanging*
	$i_{eff} = 0,09272172701$
	$\therefore$ effective rate / *effektiewe koers* $= 9,27\%\, p.a.$ ✓ answer / *antwoord* (3)
	OR/OF
		✓ formula / *formule*
	$A = 100\left(1 + \dfrac{8,9}{1200}\right)^{12}$ ✓ substitution / *vervanging*
	$= 109,27$
	$\therefore$ effective rate / *effektiewe koers*
	$= 109,27 - 100$
	$= 9,27\%$ ✓ answer / *antwoord* (3)

7.2	$A = P(1+i)^n$	
	$2 = 1\left(1+\dfrac{12,6\%}{12}\right)^{n\times 12}$	✓ substitution / *vervanging*
	$\log 2 = 12n\log\left(1+\dfrac{12,6\%}{12}\right)$	✓ use of logs / *gebruik van logs*
	$12n = \dfrac{\log 2}{\log\left(1+\dfrac{12,6\%}{12}\right)}$	✓ solving for n / *los op vir n*
	$12n = 66,36$	
	67 *months / maande*	
	OR / OF	✓ answer / *antwoord*
	$n = 5$ *years* 7 *months* / 5 *jaar* 7 *maande*	(4)

7.3	

T_0 T_1 T_2 T_3 T_4 T_5

R60 000 $-$ R5 000

7% p.a. compounded quarterly/*kwartaalliks saamgestel*   5% p.a. compounded monthly/*maandeliks saamgestel*

	$A = 60\,000\left(1+\dfrac{7\%}{4}\right)^6\left(1+\dfrac{5\%}{12}\right)^{42} - 5\,000\left(1+\dfrac{5\%}{12}\right)^{24}$	✓ $n=6$ ✓ $n=42$ and/*en* $n=24$
	$= R73\,762,19$	✓ $\dfrac{7\%}{4}$ and/*en* $\dfrac{5\%}{12}$
	OR/OF	✓ $60\,000\left(1+\dfrac{7\%}{4}\right)^6$
	$A = 60\,000\left(1+\dfrac{7\%}{4}\right)^6$	
	$= R66\,582,14$	✓ $60\,000\left(1+\dfrac{7\%}{4}\right)^6\left(1+\dfrac{5\%}{12}\right)^{42}$
	$A = 66\,582,14\left(1+\dfrac{5\%}{12}\right)^{18}$	✓ $-5\,000\left(1+\dfrac{5\%}{12}\right)^{24}$
	$= R71\,756,65$	✓ answer / *antwoord* (7)
		✓ $n=6$
	Balance after withdrawal / *Balans na onttrekking*	✓ $R66\,582,14$
	$R71\,756,65 - R5\,000 = R66\,756,65$	✓ $n=18$ and/*en* $n=24$
	$A = 66\,756,65\left(1+\dfrac{5\%}{12}\right)^{24}$	✓ $\dfrac{7\%}{4}$ and/*en* $\dfrac{5\%}{12}$
	$= R73\,762,18$ Penalise 1 mark for incorrect notation in the question / *Penaliseer 1 punt vir verkeerde notasie in die vraag*	✓ $R71\,756,65$
		✓ subtraction / *aftrekking*
		✓ final answer / *finale antwoord* (7)
		[14]

QUESTION 8/*VRAAG 8*

8.1	$f(x) = -7x^2$ $f(x+h) = -7(x+h)^2$ $\qquad = -7(x^2 + 2xh + h^2)$ $\qquad = -7x^2 - 14xh - 7h^2$ $f'(x) = \lim\limits_{h \to 0} \dfrac{f(x+h) - f(x)}{h}$ $\qquad = \lim\limits_{h \to 0} \dfrac{-7x^2 - 14xh - 7h^2 + 7x^2}{h}$ $\qquad = \lim\limits_{h \to 0} \dfrac{-14xh - 7h^2}{h}$ $\qquad = \lim\limits_{h \to 0} \dfrac{h(-14x - 7h)}{h}$ $\qquad = \lim\limits_{h \to 0}(-14x - 7h)$ $\qquad = -14x$ Answer ONLY: 0 marks *SLEGS antwoord: 0 punte*	✓ $-7x^2 - 14xh - 7h^2$ ✓ substitution / *vervanging* ✓ simplification / *vereenvoudiging* ✓ answer / *antwoord* (4)
8.2.1	$y = -\dfrac{1}{x^4} + \sqrt{x}$ $y = -x^{-4} + x^{\frac{1}{2}}$ $\therefore \dfrac{dy}{dx} = 4x^{-5} + \dfrac{1}{2}x^{-\frac{1}{2}}$	✓ $-x^{-4} + x^{\frac{1}{2}}$ ✓ $4x^{-5}$ ✓ $\dfrac{1}{2}x^{-\frac{1}{2}}$ (3)
8.2.2	$y = \dfrac{x-4}{x^{\frac{1}{2}} - 2}$ $= \dfrac{\left(x^{\frac{1}{2}} + 2\right)\left(x^{\frac{1}{2}} - 2\right)}{\left(x^{\frac{1}{2}} - 2\right)}$ $= \left(x^{\frac{1}{2}} + 2\right)$ $\dfrac{dy}{dx} = \dfrac{1}{2}x^{-\frac{1}{2}}$	✓ $\left(x^{\frac{1}{2}} + 2\right)\left(x^{\frac{1}{2}} - 2\right)$ ✓ simplification / *vereenvoudiging* ✓ answer / *antwoord* (3)
		[10]

QUESTION 9/*VRAAG 9*

9.1	$g(-5) = (-5)^3 + (-5)^2 - 16(-5) + 20$	✓ substitution / *vervanging*
	$= -125 + 25 + 80 + 20$	
	$= 0$	✓ answer / *antwoord*
	$\therefore (x+5)$ *is a factor* / *is'n faktor*	(2)

9.2	$g(x) = x^3 + x^2 - 16x + 20$	
	$= (x+5)(x^2 - 4x + 4)$	✓ $(x^2 - 4x + 4)$
	$= (x+5)(x-2)(x-2)$	✓ $(x-2)(x-2)$
	$\therefore x = -5$ or / *of* $x = 2$ or / *of* $x = 2$	✓ x-intercepts / x-*afsnitte* (3)

9.3	$g'(x) = 3x^2 + 2x - 16 = 0$	✓ $g'(x)$
	$(3x+8)(x-2) = 0$	✓ factors / *faktore*
	$3x + 8 = 0$ or/of $x - 2 = 0$	
	$x = -\dfrac{8}{3}$ or / *of* $x = 2$	✓ x-values / x-*waardes*
	$y = 50,81$ or / *of* $y = 0$	✓ y-values / y-*waardes* (4)

9.4		✓ intercepts with the axes *afsnitte met die asse*
		✓ turning points / *draaipunte*
		✓ shape / *vorm*
		(3)

9.5	$g''(x) = 6x + 2$ $g''(0) = 6(0) + 2$ $\quad\quad = 2 > 0$ $\therefore$ concave up / *konkaaf opwaarts* **OR / OF** $g''(x) = 6x + 2 = 0$ $x = -\dfrac{1}{3}$ (x-coordinate of point of inflection) $\quad\quad\quad\left(x - \text{koördinaat van die infleksiepunt} \right)$ $but/\text{maar}: 0 > -\frac{1}{3} \Rightarrow$ *concave up to the right of* $-\frac{1}{3}$ $\quad\quad\quad$ *konkaaf opwaarts regs van* $-\frac{1}{3}$	✓ $g''(x)$ ✓ substitution / *vervanging* ✓ conclusion / *gevolgtrekking* ✓ $g''(x)$ ✓ $x = -\frac{1}{3}$ ✓ conclusion / *gevolgtrekking* (3)
9.6	$x \in \left[-\dfrac{8}{3} \, ; \, 0 \right]$ *or / of* $x \in \left[2 \, ; \, \infty \right)$ **OR/OF** $-\dfrac{8}{3} \le x \le 0$ or/*of* $x \ge 2$	✓ $x \in \left[-\dfrac{8}{3} \, ; \, 0 \right]$ ✓ $x \in \left[2 \, ; \, \infty \right)$ ✓ *or / of* ✓ $-\dfrac{8}{3} \le x \le 0$ ✓ $x \ge 2$ ✓ *or / of* (3)
		[18]

QUESTION 10/*VRAAG 10*	

10.1	*Money raised / Geld ingesamel* $= x \times \left(47 - \dfrac{1}{3}x \right)$ $\quad\quad\quad\quad\quad = 47x - \dfrac{1}{3}x^2$	✓ multiplication / *vermenigvuldiging* ✓ answer / *antwoord* (2)
10.2	Profit / *Wins* $= \left(47x - \dfrac{1}{3}x^2 \right) - \left(\dfrac{1}{5}x^2 + 15x + 10 \right)$ $= 47x - \dfrac{1}{3}x^2 - \dfrac{1}{5}x^2 - 15x - 10$ $= -\dfrac{8}{15}x^2 + 32x - 10$ $P'(x) = -\dfrac{16}{15}x + 32 = 0$ $\therefore \; x = 30$	✓ method / *metode* ✓ substitution and simplification *vervanging en vereenvoudiging* ✓ answer / *antwoord* ✓ $P'(x) = 0$ ✓ answer / *antwoord* (5)
		[7]

QUESTION 11/*VRAAG 11*

11.1.1	$P(A \text{ or/}of\ B) = P(A) + P(B) - P(A \text{ and/}en\ B)$ $\qquad = 0,5 + 0,4 - 0,2$ $\qquad = 0,7$	✓ P(B) = 0,4 ✓ substitution / *vervanging* ✓ answer / *antwoord* (3)
11.1.2	$P(A \text{ and/}en\ B) = 0,2$ $P(A) \times P(B)$ $= 0,5 \times 0,4$ $= 0,2$ $\therefore \text{ Agree / } Stem\ saam:$ $P(A \text{ and/}en\ B) = P(A) \times P(B)$	✓ P(A) x P(B) = 0,2 ✓ answer / *antwoord* ✓ reason / *rede* (Use of independent rule) (*Gebruik van onafhanklikheidsreël*) (3)
11.2.1	P(R or/*of* G) = 1 **OR/OF** (100%)	✓ answer / *antwoord* (1)
11.2.2		✓ first branch with labels *eerste tak met byskrifte* ✓ second branch with labels *tweede tak met byskrifte* ✓ third branch with labels *derde tak met byskrifte* ✓ outcomes / *uitkomste* (4)
11.2.3	$\left(\dfrac{5}{y+5} \times \dfrac{4}{y+4}\right) + \left(\dfrac{y}{y+5} \times \dfrac{y-1}{y+4}\right) = \dfrac{31}{66}$ $\dfrac{20}{(y+5)(y+4)} + \dfrac{y(y-1)}{(y+5)(y+4)} = \dfrac{31}{66}$ $\dfrac{y^2 - y + 20}{y^2 + 9y + 20} = \dfrac{31}{66}$ $66y^2 - 66y + 1320 = 31y^2 + 279y + 620$ $35y^2 - 345y + 700 = 0$ $(35y + 100)(y - 7) = 0$ $y \neq -\dfrac{100}{35}$ or/*of* $y = 7$	✓ method / *metode* ✓ multiplying / *vermenigvuldiging* ✓ standard form / *standaardvorm* ✓ factors / *faktore* ✓ answer / *antwoord* (5)
		[16]
		TOTAL/*TOTAAL*: 150