QUESTION 1

1.1 Solve for x:

1.1.1 $x(7-x)=0$ (2)

1.1.2 $3x^2-2x-6=0$ (correct to TWO decimal places) (3)

1.1.3 $(3-x)(x+7)<0$ (3)

1.1.4 $\sqrt[3]{32}=8^{3x}.2^{6x}$ (4)

1.1.5 $x-4-2\sqrt{x-1}=0$ (4)

1.2 Solve the following equations simultaneously:

$x-2y=1$

$x^2-xy-2y^2=2$ (6)

1.3 It will cost R3 500 to hire a taxi for x number of friends to go on a trip. Four friends do not have money to pay. The remaining friends agree to pay extra R43,75 each to cover the cost of the taxi.

1.3.1 Calculate x, the number of friends who want to go on the trip. (5)

1.3.2 Calculate the total amount that each friend pays for this trip in order to cover the cost. (1)

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QUESTION 2

2.1 Given the arithmetic sequence: 14 ; 21 ; 28 ; ... ; 336.

2.1.1 How many terms are there in the sequence? (3)

2.1.2 Calculate the sum of all the terms of the sequence. (2)

2.1.3 The sum of two consecutive terms of the sequence: 21 ; 35 ; 49 ; ..., is 308. Determine the two terms. (4)

2.2 Show that $T_n = 4n^2 + n$ is the general term of a quadratic sequence with the following properties:

- 68 is the fourth term of the quadratic sequence.
- 7 and 25 are the second and third terms respectively, of the sequence of the first differences of the quadratic sequence. (4)

[13]

QUESTION 3

3.1 The sum to infinity of a geometric series is 6, and the sum to infinity of the squares of the terms of the series is 6.

3.1.1 Write down the second term of the series of squares in terms of a and r. (1)

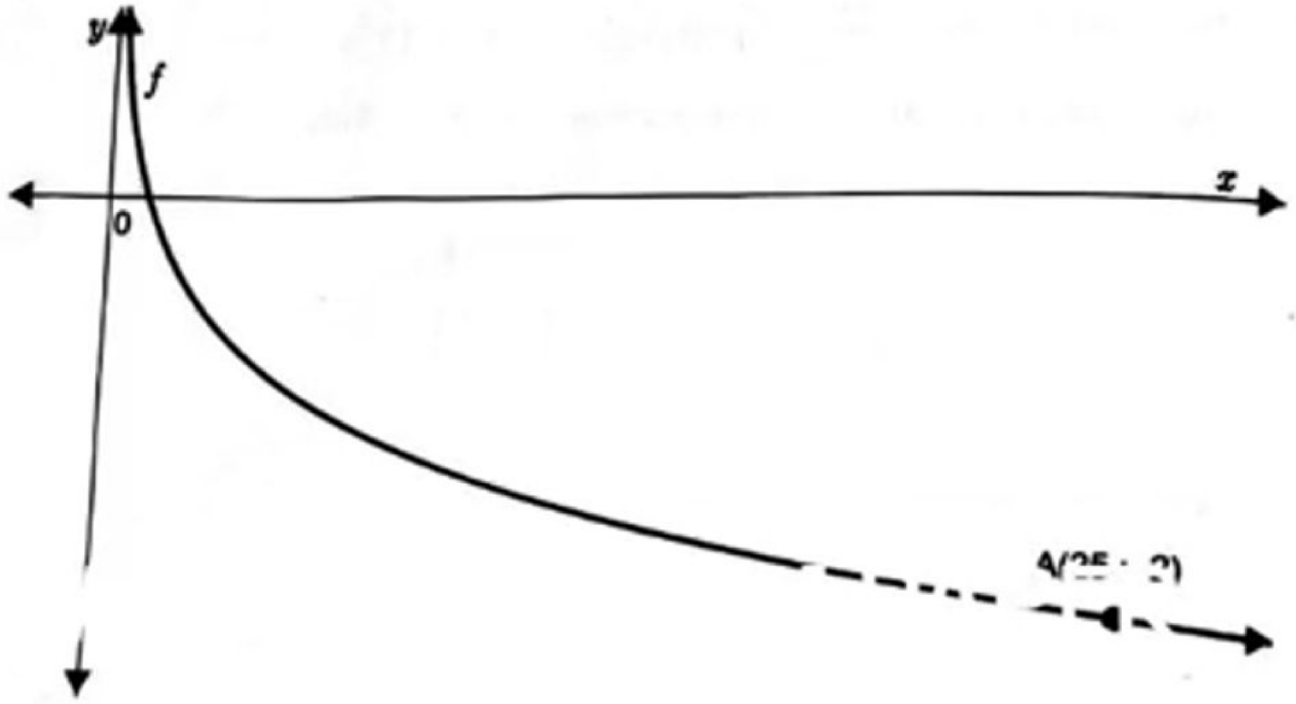
3.1.2 Calculate the values of a and r. (6)

3.1.3 Write down T_6 of the series of squares. (2)

3.2 There are 50 litres of water in a container. Water evaporates from this container at the rate of 1% per hour under certain weather conditions. How much water will be left in the container after 8 hours if left under these weather conditions? (3)

[12]

4.2 The graph of $f(x)=\log_b x$ is sketched below. A(25 ; −2) is a point on f.



4.2.1 Write down the domain of f. (1)

4.2.2 Calculate the value of b. (2)

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

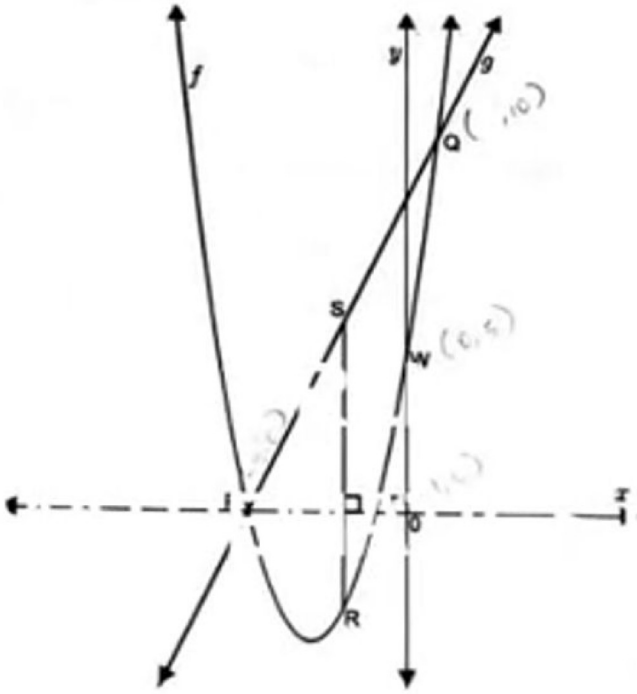
4.2.4 For which values of x is $\left(\frac{1}{5}\right)^{x+3}-5<20$? (2)

[15]

QUESTION 5

The graphs of $f(x)=ax^2+bx+c$ and $g(x)=2x+10$ are sketched below.

- Graph f intersects the x-axis at P$(-5\,;0)$ and T$(-1\,;0)$, and the y-axis at W$(0\,;5)$
- The two graphs intersect at points Q and P.
- R and S are points on f and g respectively such that SR is perpendicular to the x-axis.



5.1 Show that $f(x)=x^2+6x+5$. (3)

5.2 Calculate the coordinates of Q. (4)

5.3 Show that $f(x)\neq -5$ for all values of x. (3)

5.4 Consider point R when SR is at its maximum in the interval $x_P < x < x_Q$.
Determine:

5.4.1 The gradient of the tangent to f at R. (4)

5.4.2 The equation of the tangent to f at R. (3)

5.5 Consider $x > x_p$. For which values of x is $g(x)-g^{-1}(x)>15$? (3)

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QUESTION 6

6.1 Daniel deposits a sum of money into a savings account. The bank offers interest at the rate of 5% p.a., compounded monthly.
Calculate the effective interest rate that Daniel receives. (2)

6.2 A bank granted Matome a home loan for R800 000 when he started working some years ago. The loan was to be repaid over a period of 25 years. The rate of interest on the loan was 10,75% p.a., compounded monthly.

6.2.1 Matome made his first repayment one month after the loan was granted and he continued to make monthly repayments thereafter.
Calculate Matome's monthly repayments. (4)

6.2.2 Matome continued to make monthly repayments. Calculate the balance outstanding immediately after making the 240th monthly repayment. (3)

6.2.3 After making payments for the full 20 years, Matome lost his job and missed the next three monthly repayments. He then found another job and resumed his monthly repayments. However, Matome started paying R9 000 monthly instead of the required amount.
Did Matome settle the loan in the original repayment period? Justify your answer with relevant calculations. (5)

[14]

QUESTION 7

7.1 If $f(x)=4x^2-x$, determine $f'(x)$ from first principles. (5)

7.2 Determine

7.2.1 $\frac{dy}{dx}$ if $y=-x^3-16x^2+6x$ (3)

7.2.2 $f'(x)$ if $f(x)=\frac{4}{5x^{-3}}-\frac{3}{\sqrt[3]{x^2}}$ (4)

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QUESTION 8

Given: $f(x)=ax^3+bx^2+cx+d$ with the following properties:

- $f(-2)=f(1)=0$
- $f'(1)=f'(-1)=0$
- $f(-1)=4$
- $f(0)=2$
- $f'(x)<0$ for $-1<x<1$

8.1 Draw the graph of f. Indicate clearly the co-ordinates of the turning points and the intercepts. **(4)**

8.2 Determine the equation of f in the form of $y=...$ **(5)**

8.3 If $g(x)=f(x-1)$ write down the x-intercepts of g. **(2)**

8.4 Determine the values of p for which $x^3-3x+2=p$ will have exactly one root. **(2)**

[13]

QUESTION 9

A boy uses 12 m of wire to form a circle and a square. Each side of the square is x m long.

9.1 Show that the total area of the square and the circle formed is given by: **(6)**

$$A=\frac{(4+\pi)x^2-24x+36}{\pi}$$

9.2 Determine the value of x for which the total area is minimum. **(2)**

[8]

QUESTION 10

10.1 At a school, learners may choose subjects from only one of the following streams: Commerce, Science or Humanities. There are 100 learners in Grade 12 at this school. Their choice of subjects is summarised in the table below.

	Commerce (C)	Science (S)	Humanities (H)	Total
Girls (G)	12	15	23	50
Boys (B)	8	20	22	50
Total	20	35	45	100

10.1.1 Calculate the probability that a learner chosen at random from this group is a girl. (1)

10.1.2 Calculate the probability that a learner chosen at random from this group has chosen Science. (1)

10.1.3 Are the events: being a girl and choosing Science independent? Justify your answer. (3)

10.2 How many 4-digit codes will be formed using digits: 0 ; 1 ; 2 ; 3 ; 4 ; 7 ; 9? Consider the following conditions:

- The code must be an even number (i.e. must be divisible by 2).
- The first digit must be less than 4.
- Digits may be repeated. (2)

10.3 The letters of the word LEOPARD are randomly arranged into different 7-letters words. Letters may not be repeated.

10.3.1 In how many different ways can the letters of this word be arranged? (1)

10.3.2 Determine the number of different ways in which a word formed will start with a vowel and end with a consonant. (3)

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10.3.3 Calculate the probability that in the different words formed in 10.3.1, all vowels will not follow each other. (4)

[15]

TOTAL:150