

Grade 12 – Maths Paper 1

QUESTION 1

Solve for x , correct to TWO decimal places, where necessary:

1.1 $7x^2 - 6x(x + 2) + 10x = -24$ (4)

1.2 $(x - 5)(x + 2) + 7 = 0$ (4)

1.3 $-5 - 13x < 6x^2$ (5)

1.4 Solve for x and y simultaneously:

$$3y - x - 4 = 0 \quad (1)$$

$$x^2 - xy + y^2 = 3 \quad (2) \quad (6)$$

1.5 Given that $K = \frac{2213^2 - 6639}{2210}$ calculate the value of K without using a calculator. (3)

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QUESTION 2

2.1

$$\sum_{t=0}^{99} (3t - 1)$$

2.1.1 Write down the first THREE terms of the series. (3)

2.1.2 Calculate the sum of the series. (4)

2.2 The geometric series $11 + 22 + 44 + 88 + \dots$ to 20 terms

2.2.1 What is the general term of the series? (2)

2.2.2 Calculate the value of the sum to 20 terms. (3)

2.3 The sequence $3 ; 9 ; 17 ; 27 ; \dots$

2.3.1 Write down the next term. (2)

2.3.2 Determine an expression for the n^{th} term of the sequence. (4)

2.3.3 What is the value of the first term of the sequence that is greater than 269? (4)

2.4 $5(3)^4 + 5(3)^3 + 5(3)^2 + \dots$ is a convergent series.

2.4.1 Explain why the series converges. (2)

2.4.2 Calculate the sum to infinity of the series. (3)

2.5 The sum of the first n terms of a sequence is given by $S_n = 2^{n+2} - 4$

2.5.1 Determine the sum of the first 24 terms. (2)

2.5.2 Determine the 24th term. (3)

2.5.3 Prove that the n th term of the sequence is 2^{n+1} . (3)

2.6 Prove that: $a + (a + d) + (a + 2d) + (a + 3d) + \dots$ to n terms $= \frac{n}{2}[2a + (n - 1)d]$ (4)

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QUESTION 3

In the figure the graphs of the following functions are shown:

$$f(x) = x^2 - 10x + 9 \text{ and } g(x) = 2x - 2$$

E is the turning point of f

3.1 Determine the co-ordinates of the following points:

3.1.1 A (2)

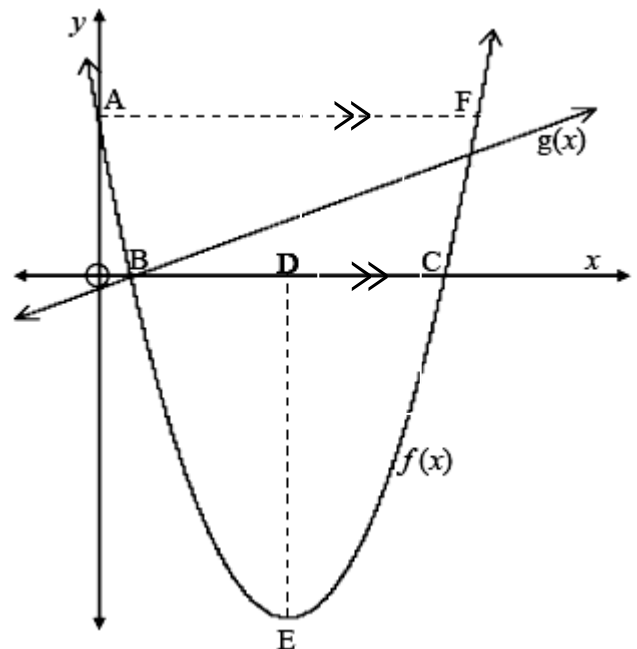
3.1.2 B and C (3)

3.2 Determine the lengths of:

3.2.1 OD (2)

3.2.2 DE (2)

3.2.3 AF (2)



[11]

QUESTION 4

4.1 Given $g(x) = \frac{2}{x}$ and $f(x) = \frac{-2}{x-3} + 2$

4.1.1 Describe the three transformations needed to obtain the graph of $f(x) = \frac{-2}{x-3} + 2$, from the graph of $g(x) = \frac{2}{x}$ (3)

4.1.2 Graph the function $f(x)$ on the DIAGRAM SHEET. (4)

4.1.3 Give the domain of $f(x)$ (2)

4.1.4 Give the equation(s) of the asymptotes of $f(x)$. (4)

4.2 Which of the following functions does not increase over the interval (0; 10)?

a) $y = \log x$ b) $y = 10^x$ c) $y = \frac{10}{x}$ (2)

[15]

QUESTION 5

5.1 Given that $h(x) = 2x^2$.

5.1.1 Write down the equation of h^{-1} in the form $h^{-1}(x) = \dots$ (2)

5.1.2 Is $h^{-1}(x)$ a function. Give a reason for your answer. (3)

5.2 Given the functions:

$$f(x) = 2^x \text{ for } x \in \mathbb{R} \quad \text{and} \quad g(x) = \frac{2}{x} \quad \text{for } x > 0$$

5.2.1 On your graph indicate, all intercepts with the axes and the co-ordinates of any point(s) of intersection. (5)

5.2.2 Write down the defining equation of h , which is the reflection of f in the y-axis. (1)

5.2.3 Write f^{-1} in the form $y = \dots\dots\dots$ (2)

5.2.4 Sketch f^{-1} on the diagram. (2)

5.2.5 For which values of x is $f^{-1} > 0$ (2)

5.2.6 f^{-1} is reflected in the x-axis to give a new graph. Write down the equation of the graph as $y =$ (1)

[18]

QUESTION 6

6.1 After 4 years of straight line depreciation, a car has a $\frac{1}{4}$ of its original value. The original value was R120 000. Calculate the depreciation interest rate. (Correct your answer to 1 decimal place.) (3)

6.2 Mr Samuels bought a car for R119 000. In 5 years time, the trade-in value for the car will be R57 627,20.

6.2.1 What is the annual depreciation rate, on a reducing balance, that was used to calculate the trade-in value? (3)

Mr Samuels decides that in 5 years time, he will give his car to his son and then buy a new car of R189 000. He sets up a sinking fund to make provision for the purchase price of this car. The account used offers 8,7% interest per annum, compounded monthly.

6.2.2 Calculate the effective yearly interest rate, correct to one decimal place. (3)

- 6.2.3 Calculate the monthly payment into the sinking fund. Payments are made at the end of each month. (5)
- 6.3 Amina negotiates a loan of R300 000 with a bank which has to be repaid by means of monthly payments of R5 000. The repayments start one month after the granting of the loan. Interest is fixed at 18% per annum, compounded monthly.
- Determine the number of payments required to settle the loan (6)
- 6.4 Given: $A = P(1 + ni)$ where P and i are positive constants.
- 6.4.1 State whether the graph of A , as a function of n , is linear, quadratic, exponential or none of these. (1)
- 6.4.2 Draw a possible graph of A , as a function of n . (2)
- 6.4.3 If n increases by 1, determine the increase in A . (2)
- [25]**

QUESTION 7

While preparing for the 2011 Soccer Cup in Mpumalanga, a group of investors decided to build a guesthouse with single and double bedrooms to hire. They came up with the following constraints for the guesthouse:

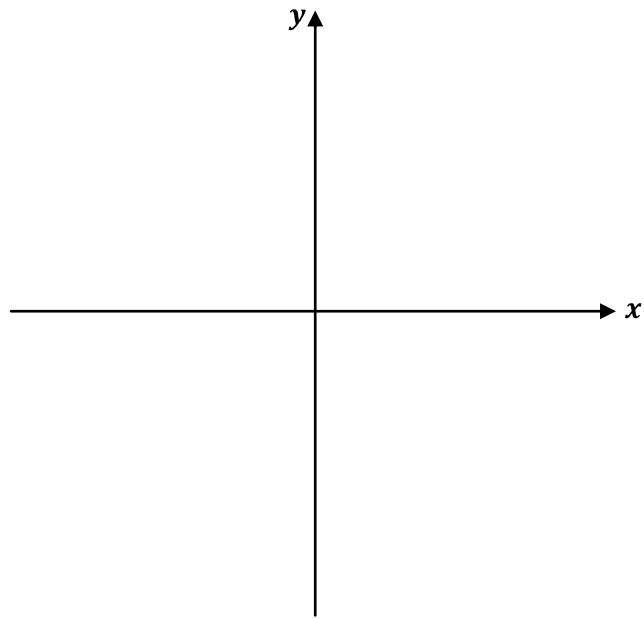
- There must be at least one single bedroom.
- They intend to build at least 10 bedrooms, but not more than 15.
- Furthermore, the number of double bedrooms must be at least twice the number of single bedrooms.
- There should not be more than 12 double bedrooms.

- 7.1 Let the number of single bedrooms be x and the number of double bedrooms be y . Write down the constraints as a system of inequalities. (7)
- 7.2 Represent the system of constraints on the graph paper provided on the DIAGRAM SHEET. Indicate the feasible region by means of shading. (7)
- 7.3 According to these constraints, could the guesthouse have 5 single bedrooms and 8 double bedrooms? Motivate your answer. (3)
- 7.4 The rental for a single bedroom is R600 per night and R900 per night for a double bedroom. How many rooms of each type of bedroom should the contractors build so that the guesthouse produces the largest income per night? Use a search line to determine your answer and assume that all bedrooms in the guesthouse are fully occupied. (3)
- [20]**

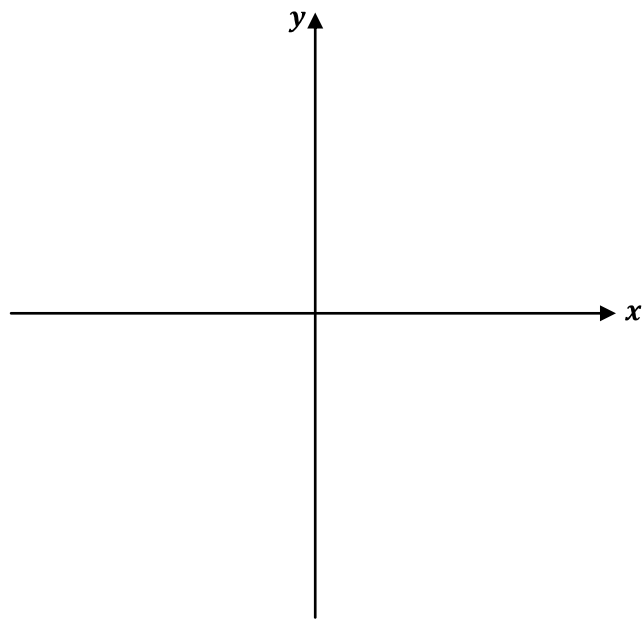
DIAGRAM SHEET

NAME:

4.1.2



5.2.1



5.2.1

