GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

JOHANNESBURG WEST DISTRICT

TERM 1
CONTROLLED TEST
12 MARCH 2025

GRADE 12

MATHEMATICS

MARKS: 50 **DURATION: 1 HOUR**

This question paper consists of 6 pages including the formula sheet.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of 7 questions.
2. Answer ALL the questions in your answer book.
3. Use the appropriate and correct numbering system as it is used on this paper.
4. Clearly show ALL calculations, diagrams, graphs, et cetera that you have used in determining your answers.
5. Answers only will NOT necessarily be awarded full marks.
6. An approved scientific calculator (non-programmable and non-graphical) may be used, unless stated otherwise.
7. If necessary, answers should be rounded off 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 this paper.
10. It is in your own interest to write legibly and to present your work neatly.

QUESTION 1

1.1 Solve for x.

1.1.1 $x(x-2)-1=-1$ (3)

1.1.2 $x^2-5x+4<0$ (3)

1.2 Solve for x and y.

$10^x \, . \, 20^y = 50$ (4)

[10]

QUESTION 2

The first three terms of the linear pattern are $(x+5)$; $(-x+5)$ and $(-x-5)$.

2.1 Prove that the sum of these first three terms is equal to 0 . (3)

2.2 Which term of this linear pattern will be the first to be less than $-20\,220$? (3)

[6]

QUESTION 3

Given the quadratic pattern: 0 ; 21 ; 54 ; 99 ; ...

3.1 Determine the general term of this pattern in the form $T_n = an^2 + bn + c$. (4)

3.2 Which two consecutive terms of the first differences of this quadratic pattern will have a quotient of $\frac{183}{187}$? (3)

[7]

QUESTION 4

A geometric series is given by: $\frac{1}{3} + \frac{1}{9} + \frac{1}{27} + \ldots$

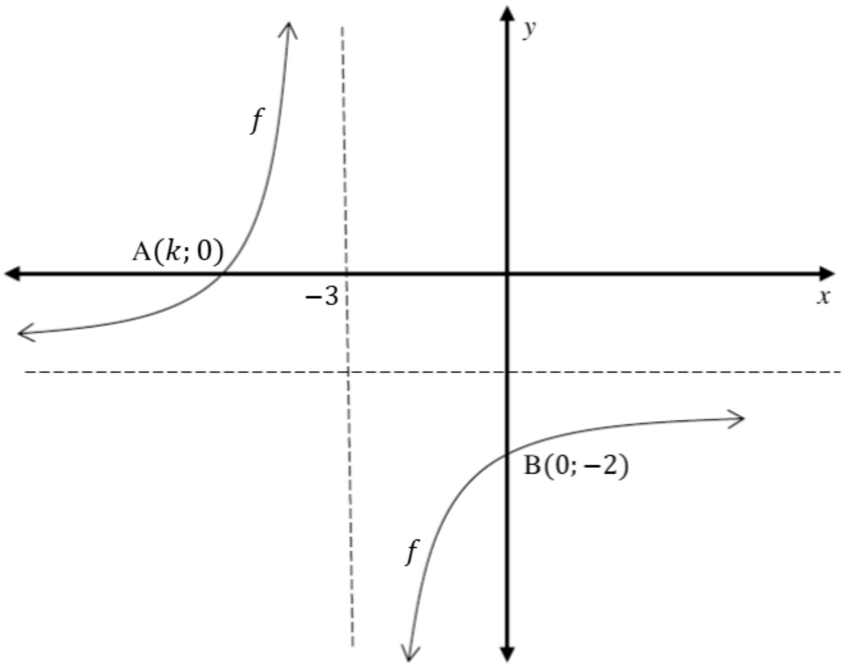
4.1 Is this geometric series convergent? Explain. (2)

4.2 Express the above geometric series in sigma notation. (3)

[5]

QUESTION 5

The graph of $f(x) = -\frac{3}{x+p} + q$ is sketched below. A$(k;0)$ and B$(0;-2)$ are the x- and y-intercepts respectively.



5.1 Write down the domain of f. (2)

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

5.3 Calculate the value of k. (2)

5.4 For which value (s) of x will $f(x) < 0$ (2)
[9]

QUESTION 6

An exponential function is given by: $h(x) = \left(\frac{1}{5}\right)^x$

6.1 Calculate the value of $h(-1)$. (2)

6.2 Determine the equation of the inverse of h in the form $h^{-1}(x) = \cdots$. (2)

6.3 Draw the neat sketch of h and h^{-1} on the same set of axes. Indicate all the critical features. (3)
[7]

QUESTION 7

Given the compound angle formula: $\cos(A - B) = \cos A.\cos B + \sin A.sinB$

7.1 Use the above formula to derive the specific formula for $\sin 2A$. (3)

7.2 If $\sin 15° \cos 15° = m$, determine $\sin 330°$ in terms of m , **without using a calculator**. (3)
[6]

TOTAL = 50 MARKS

INFORMATION SHEET

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

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

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

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

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

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

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

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

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

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

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

$area\ \Delta ABC = \frac{1}{2}ab.\sin C$

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

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

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

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

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

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