HOËRSKOOL JOHAN JURGENS

MATHEMATICS

GRADE 12: CYCLE TEST **FEB 2026:** TERM 1

TIME: 1 HOUR **TOTAL MARKS**: 50

EXAMINER: Z. CRONJE **MODERATOR**: M BOTHA

INSTRUCTIONS TO LEARNERS:

1. There are SIX questions and 4 pages. Answer all the questions.
2. Make sure your answers are neat and legible. Write with ONLY a black pen.
3. Use the same numbering system as on the question paper.
4. Show all the calculations and diagrams you use to obtain the answer where necessary.
5. A non-programmable, non-graphical scientific calculator may be used.
6. If necessary, answers should be rounded off to TWO decimal places, unless stated otherwise.

This paper consists of 5 pages and 6 questions, including an information sheet.

QUESTION 1

Solve for x:

1.1 $x^2 - 7x + 10 = 0$ (2)

1.2 $\sqrt{2 - x} = x - 2$ (4)

[6]

QUESTION 2

Consider the quadratic sequence: 2; 7; 14; 23; …

2.1 Write down the fifth term. (1)

2.2 Determine the general term T_n (4)

2.3 If 5 is added to each term of the quadratic sequence, between which two terms of the sequence is the first difference 57? (3)

[8]

QUESTION 3

3.1 10; a; 24; b; 38; … are the first five terms on an arithmetic progression.

3.1.1 Show that $a = 17$ and $b = 31$ (2)

3.1.2 Calculate the sum of the first 67 terms of the sequence. (2)

3.1.3 If there are 67 terms in the arithmetic sequence, determine the sum of all the even terms of this sequence. (3)

3.2 Calculate the value of:

$$\sum_{r=2}^{\infty} 3.2^{1-r} + \sum_{r=2}^{12} 3.2^{1-r}$$

(give your answer to 3 decimal places). (3)

[10]

QUESTION 4

4.1 $(x-2)^2 + (x-2)^3 + (x-2)^4 + \cdots$ form a geometric series.

4.1.1 Write down the common ratio. (1)

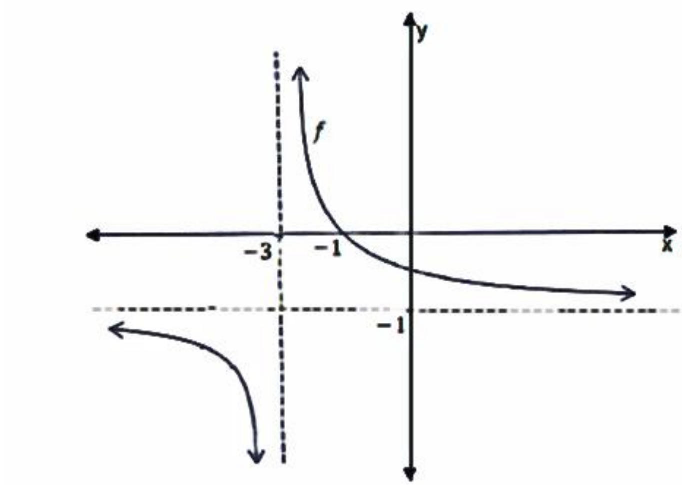
4.1.2 Determine the value(s) of x for which the series will converge. (2)

4.2 Mr James gave his four daughters R 8 400 to share, such that their shares formed terms of a geometric sequence. The largest share was 27 times the smallest share. Determine the amount each daughter received. (4)

[7]

QUESTION 5

The graph $f(x) = \frac{2}{x+p} + q$ is sketched below:



5.1 Write down the values of p and q. (2)

5.2 The straight line $g(x) = -x + k$ is one of the axes of symmetry of the graph of f. Determine the value of k. (2)

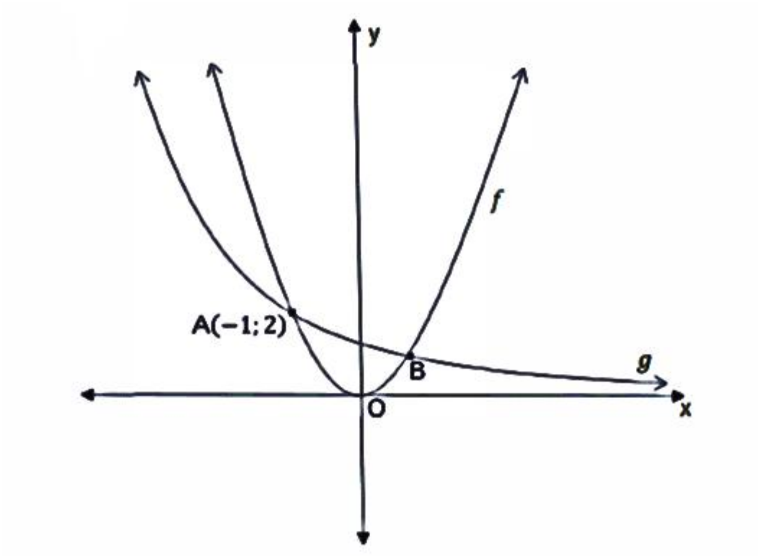
5.3 If $h^{-1}(x) = -2[g(x)]$, determine the equation of the inverse of h , h^{-1}, in the form $h^{-1}(x) = mx + c$. (3)

5.4 Draw a neat sketch of h and h^{-1} on the same set of axes. Clearly show all intercepts with axes, points of intersection and the axis of symmetry. (4)

[11]

QUESTION 6

The graphs of $f(x) = ax^2$ and $g(x) = b^x$ are sketched on the same set of axes. Points A(-1;2) and B are points of intersection of f and g. The graph of f has the turning point at the origin.



6.1 Calculate the values of a and b. (2)

6.2 The inverse of f is NOT a function. Write down at least one condition which can be used to restrict the domain of f such that its inverse will be a function. (1)

6.3 For which value(s) of x, where $x \in (-\infty; 0]$, will $g(x) \leq f(x)$? (2)

6.4 If $h(x) = g(x+3)$, write down the coordinates of

6.4.1 A', the new coordinates of A on the graph of h. (1)

6.4.2 A'', the new coordinates of A on the graph of h^{-1}, the inverse of h. (2)

[8]

TOTAL 50 MARKS

INFORMATION SHEET

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

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

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

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

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

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

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

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

$(x - a)^2 + (y - b)^2 = r^2$ $\quad$ In ΔABC: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$

In ΔABC: $a^2 = b^2 + c^2 - 2bc.\cos A$ $\quad$ Area $\Delta ABC = \frac{1}{2}ab.\sin C$

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

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

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

$\sin 2\alpha = 2\sin\alpha.\cos\alpha$

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

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

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