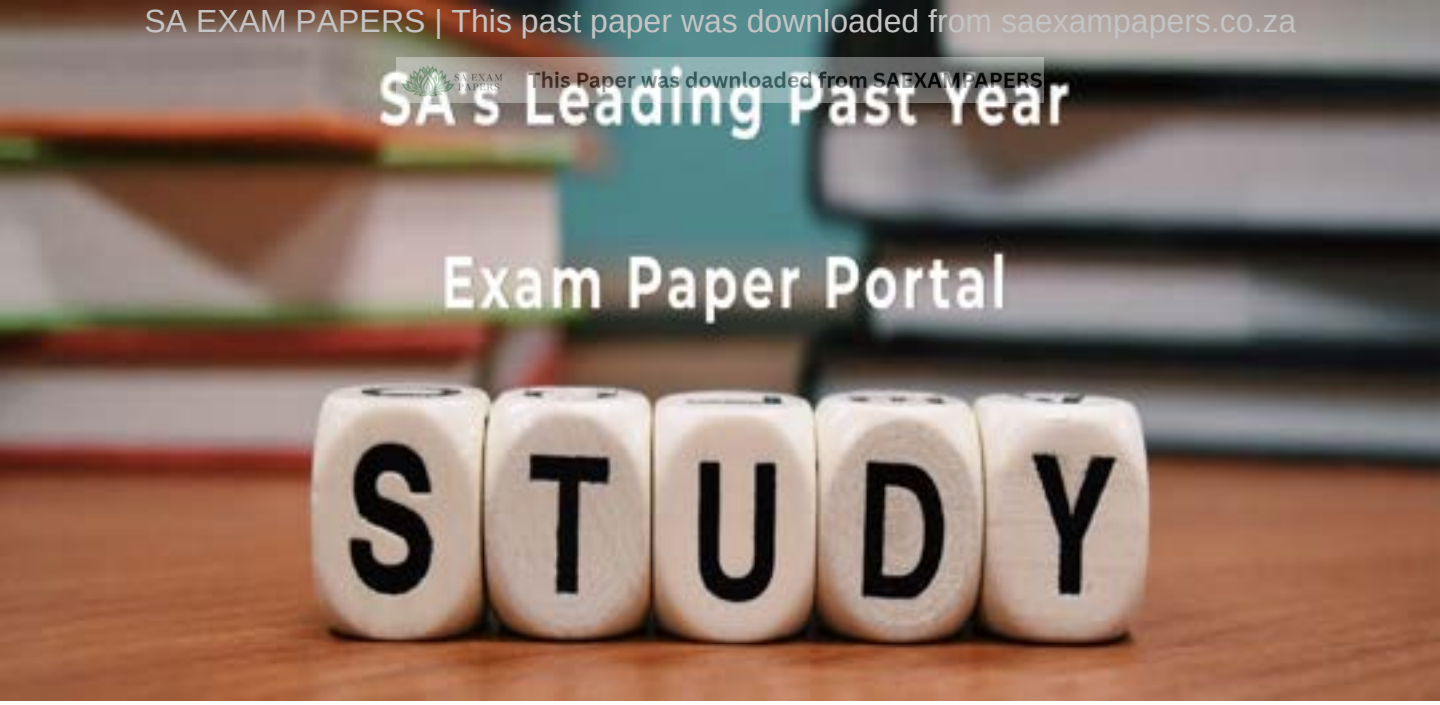


JHB EAST

MATHEMATICS

2026 TERM 1

CONTROLLED TEST

GRADE 12

MARKS: 75

DURATION: 1, 5 hours

This question paper consists of 8 pages including a diagram sheet.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of 5 questions
2. Answer ALL the questions.
3. Clearly show ALL calculations, diagrams, graphs, etc. Which you have used in determining your answers.
4. Answers only will NOT necessarily be awarded full marks.
5. You may use an approved scientific calculator (non-programmable and non-graphical.) unless stated otherwise.
6. If necessary, round off answers to TWO decimal places, unless stated otherwise.
7. Diagrams are NOT necessarily drawn to scale.
8. An information sheet with formulae is included at the end of the question paper.
9. Write neatly and legibly.

QUESTION 1

Solve for x:

1.1 $2x^2 + x - 3 = 0$ (2)

1.2 $\sqrt{3x+1} - x = -1$ (5)

1.3 $(2-x)(x+5) > 0$ (3)

1.2 $3^x = k^2 - 1$, Determine the values of k for which an equation will be real for all real values of x? (3)

[13]

QUESTION 2

2.1 A Quadratic number pattern has the following properties:

- $T_n = an^2 + bn - 2$
- The n^{th} term of the 1st differences is $-6n - 2$.

2.1.1 Show that $a = -3$ and $b = -1$. (3)

2.1.2 Is -19122 one of the terms in the sequence? Justify your answer with calculations and conclude. (4)

2.2 Consider the series: $3 + 9 + 15 + \cdots + 273$

2.2.1 How many terms are in the series? (3)

2.2.3 Determine the sum of the terms in the series. (2)

2.3 In a certain geometric series, the constant ratio is 3, the first term is 1 and $T_n = t$. Express S_n in terms of t. (4)

2.4 Gold is extracted from old mine heaps using a chemical process. When 1000 tons of gravel is processed for the first time, 30 kg of gold is recovered. The next time the same gravel is processed, 24 kg of gold is recovered. On the third attempt 19,2 kg of gold is recovered, on the fourth 15,36 kg and so on.

What is the maximum amount of gold that can be recovered from 1000 tons of gravel? (3)

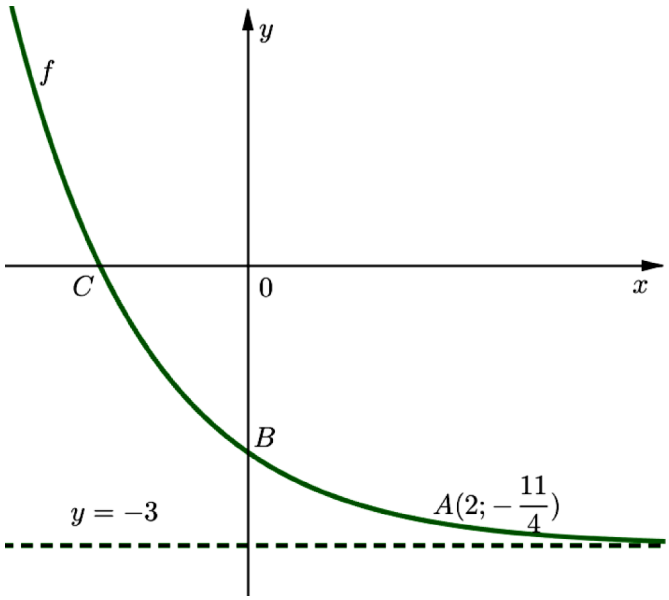
2.5 Determine the value of m if:

$$\sum_{k=3}^{m} 8(2)^{k-1} = 131\,040 \quad (5)$$

[24]

QUESTION 3

In the diagram below, $f(x) = a^x + q$. The equation of horizontal asymptote of f is $y = -3$. f passes through A$\left(2\ ;\ -\frac{11}{4}\right)$. B and C are y-intercept and x-intercept respectively.



3.1 Determine the numerical value of a (2)

3.2 Determine the coordinates of: (2)

3.2.1 B (2)

3.2.2 C (2)

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

3.4 If $g(x) = log_2(x - 3)$, describe the transformation from f^{-1} to g. (2)

3.5 Determine the values of x for which:

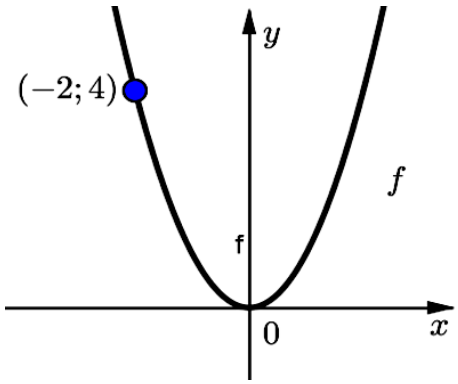
3.5.1 f^{-1} decreases. (1)

3.5.2 $f^{-1}(x) > 2$ (1)

[12]

QUESTION 4

In the diagram below, $f(x) = ax^2$. The graph passes through $(-2; 4)$ and the turning point the origin.



4.1 If f is restricted so that $f^{-1}$is a function, determine the restricted values of x. (1)

4.2 Determine the equation of f^{-1}in the form $y =$….Show all the restrictions if applicable. (3)

4.3 It is further given that $g(x) = f(x + 1) - 3$. If $g(x) + k = 0$, Find the values of k for which g will have TWO unequal negative roots, (4)

[8]

QUESTION 5

5.1 If $12tan\beta + 5 = 0$ where $\sin\beta > 0$ *and* $17\cos\alpha - 15 = 0$ where $\alpha \in [0^o; 180^o]$, WITHOUT using a calculator, determine:

5.1.1 $sin(-\beta)$ (2)

5.1.2 $cos(\beta + \alpha)$ (3)

5.2 $$Given: \frac{2cos(90^o - x).cos(180^o + x)}{sin^2(90^o + x) + sin(-x), sin(180^o - x)}$$

5.2.1 Simplify the above expression to a single trigonometric ratio. (8)

5.2.2 Hence or otherwise, determine the general solution if: (3)

$$\frac{2cos(90^o - x).cos(180^o + x)}{sin^2(90^o + x) + sin(-x), sin(180^o - x)} = \frac{1}{2}$$

5.3 Prove that $cos25^o - cos35^o = sin5^o$ (3)

[19]

TOTAL: 75

INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

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

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

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

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

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

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