GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

GAUTENG PROVINCE

GRADE 12

MATHEMATICS
FIRST PUSH
MARCH 2025

MARKS: 130

DURATION: 2 hours 36 minutes

This question paper consists of 9 pages, and 1 information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 9 questions.
2. Answer ALL the questions.
3. Number the answers correctly according to the numbering system used in this question paper
4. Clearly show ALL calculations, diagrams, graphs, et cetera which you have used in determining your answers.
5. Answers only will NOT necessarily be awarded full marks.
6. You may use an approved scientific calculator (non-programmable and non-graphical), 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 the question paper.
10. Write neatly and legibly.

QUESTION 1

1.1 Solve for x:

1.1.1 $5x^2 - 4x = 0$ (2)

1.1.2 $3x^2 = 2(x + 2)$ (Leave your answer correct to TWO decimal places) (4)

1.1.3 $4 + 5x > 6x^2$ (4)

1.1.4 $5^{-x}.5^{x-2} = \frac{25^{2x}}{5}$ (3)

1.2 If 2 and -4 are the roots of the equation $x^2 + bx + c = 0$

Determine the values of b and c. (2)

1.3 Solve simultaneously for x and y:

$x - 3y = 1$

$x^2 - 2xy + 9y^2 = 17$ (6)

1.4 For which values of p will the equation $x^2 + x = p$ have no real roots? (3)

[24]

QUESTION 2

2.1 The arithmetic series 3+5+7+….+103 is given.

2.1.1 Determine the general term (2)

2.1.2 Calculate the number of terms in the given series (1)

2.1.3 Hence, write the series in sigma notation (2)

2.2 Calculate n if :

$$\sum_{n=2}^{n}(2n + 1) > 192$$ (5)

2.3 The sum of the 1st and 2nd terms of a geometric series is 30, and the sum to infinity is 54.

Determine the 1st term a, and the common ratio, r, with $r > 0$.

(6)
[16]

QUESTION 3

3.1 The sequence 4; 9; x; 37;…..is a quadratic sequence

3.1.1 Calculate x. (3)

3.1.2 Hence, or otherwise, determine the n^{th} term of the sequence. (4)

3.2 The sum of the first n terms of a sequence is:

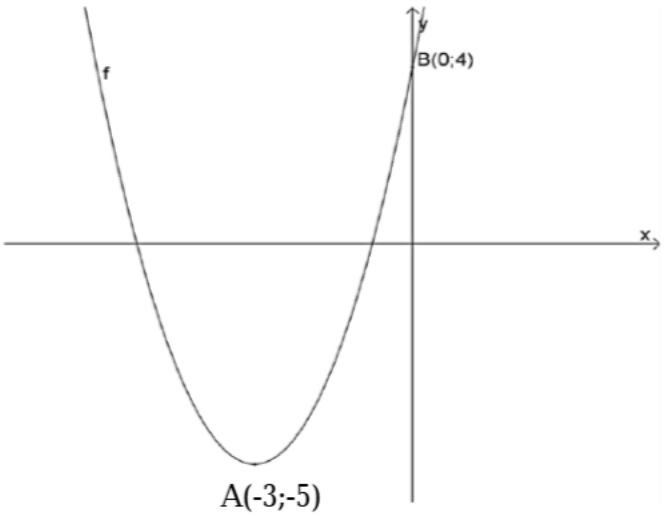
$$S_n = 3^{n-5} + 2$$

Determine the 80^{th} term. Leave your answer in the form $a.b^p$ where a, b and p are all integers (3)

[10]

QUESTION 4

4.1 The sketch below is the graph of a parabola, $f(x) = ax^2 + bx + c$, which is not drawn to scale, the turning point and the y – intercept of the parabola are A(–3; –5) and B(0; 4) respectively.

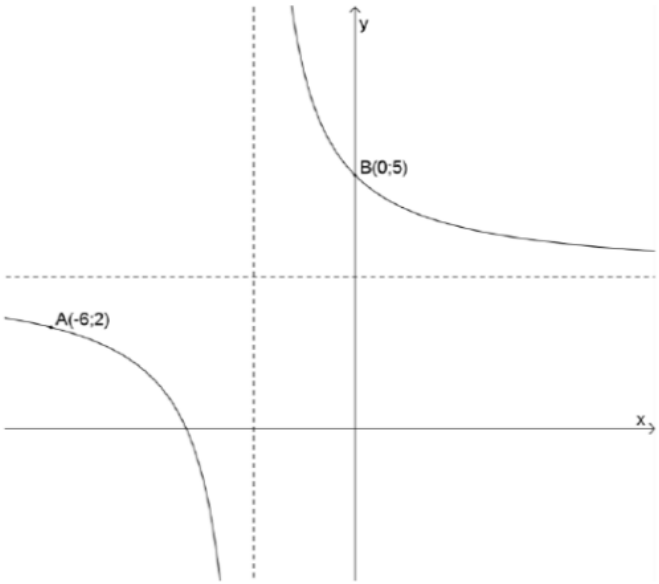


4.1.1 Write down the equation of the axis of symmetry of f. (1)

4.1.2 Use the symmetry line to write down the coordinates of another point on the parabola. (2)

4.1.3 Determine the equation of the parabola. (4)

4.2 In the figure, the graph of $f(x)=\frac{a}{x+2}+b$, is drawn. A(-6; 2) is a point on f and B(0; 5) is the y-intercept of f.



4.2.1 Write down the equation of the vertical asymptote of f. (1)

4.2.2 Determine the value of a and b. (6)

4.2.3 Is f an increasing or decreasing function? Motivate your answer. (2)

4.2.4 Determine the equation of the line of symmetry of f, where m > 0. (2)
[18]

QUESTION 5

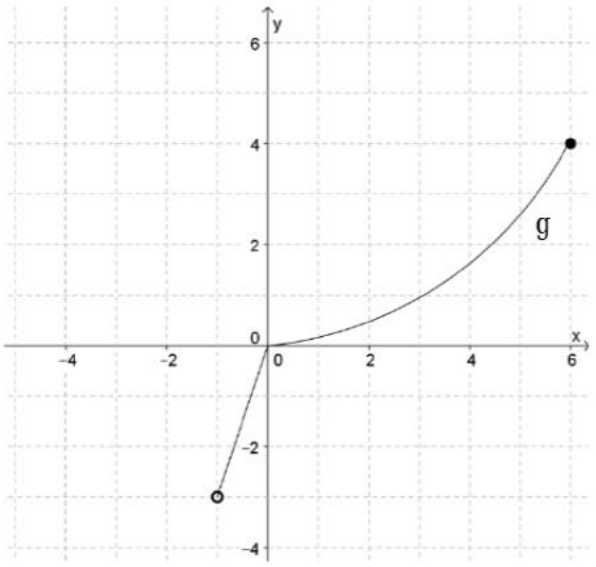
5.1 Consider $f: x \rightarrow 4^x$

5.1.1 Sketch graphs of f and f^{-1},(**on diagram sheet 1)** the inverse of f, indicate the intercepts with axis and one other point on each graph (4)

5.1.2 If $(a;8) \in f$, determine the value of a. (3)

5.1.3 Give the equation of g, the reflection of f in the y – axis. (2)

5.2 The graph of the function g is shown below and is redrawn on the **diagram sheet 2**.



5.2.1 Write the domain and range of the function. (2)

5.2.2 On the set of axes , draw the graph of the inverse function of g. (4)

5.2.3 Explain why this inverse is a function. (1)

[16]

QUESTION 6

6.1 If $\sin^2 A = \frac{9}{25}$ and $90° < A < 180°$, determine without using a calculator the value of each of the following:

6.1.1 tan A (3)

6.1.2 $\frac{1-\cos A}{\sin^2(180°+A)}$ (3)

6.2 Given : $\frac{sin2x-cosx}{1-cos2x-sinx} = \frac{cosx}{sinx}$

6.2.1 Prove the above identity. (4)

6.2.2 For which values of x will the identity be undefined? (3)

[13]

QUESTION 7

7.1 Show that: $\sin(A+B) - \sin(A-B) = 2\cos A \sin B$ (3)

7.2 Hence, or otherwise, calculate without a calculator the value of : (6)

$\frac{\sin 105°-\sin 15°}{\sin 105°+\sin 15°}$

7.3 Given: $\cos 3A = 4\cos^2 A - 3\cos A$

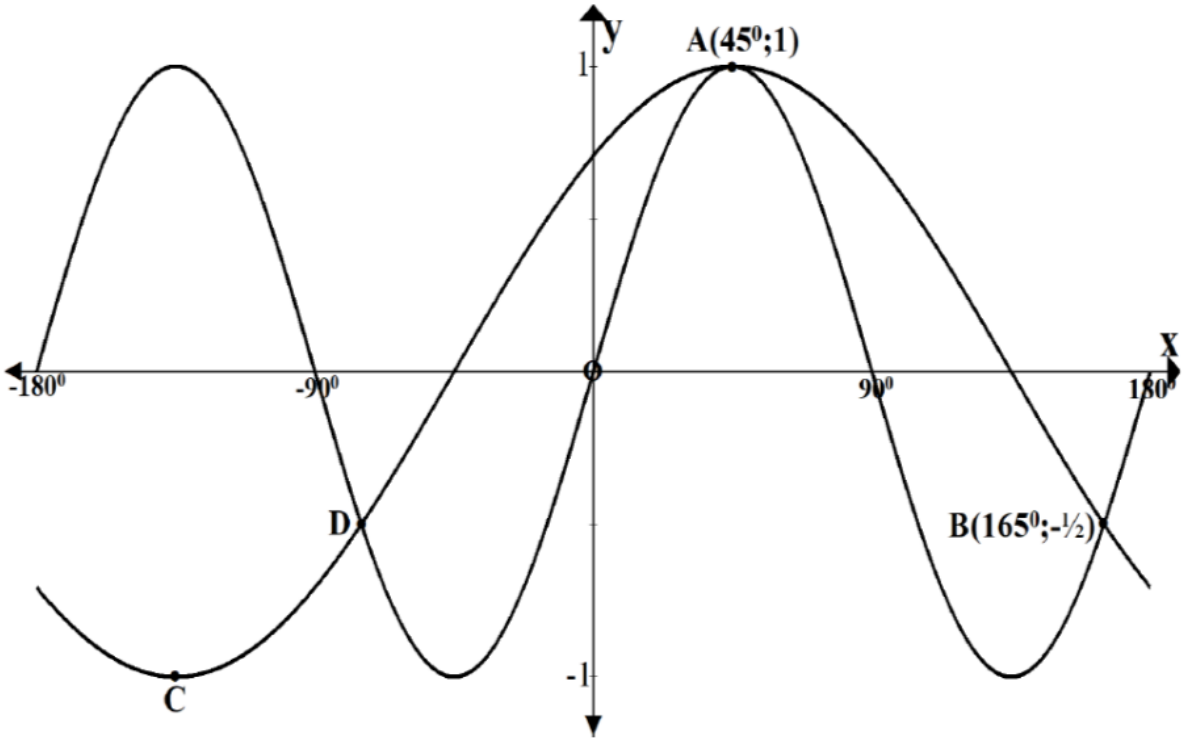
7.3.1 Prove that: $\cos 3A = 4\cos^2 A - 3\cos A$ (5)

7.3.2 Hence calculate, without a calculator the value of $\cos 3A$ if $\tan A = \frac{3}{4}$ and $A > 180°$ (4)

[18]

QUESTION 8

In the following sketch the graphs of $f(x) = \sin ax$ and $g(x) = \cos(x + b)$; x ε $[-180° ; 180°]$ is given. The coordinates of A and B is $(45°; 1)$ and $(165°; \frac{1}{2})$ respectively



8.1 Determine the values of a and b. (2)

8.2 Write down the period of g? (1)

8.4 If C is the turning point of g, determine the coordinates of C. (2)

8.5 Use the graphs of f and g to solve the following equation: (4)

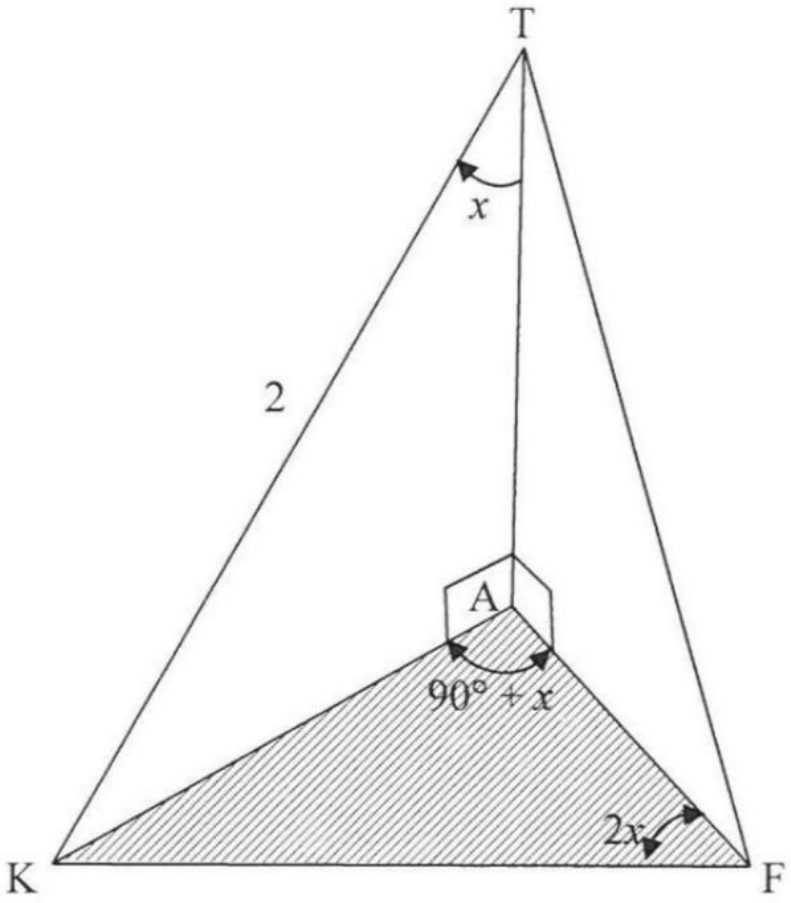
$$\sqrt{2}\sin 2x = \cos x + \sin x$$

[9]

QUESTION 9

In the figure below K, A and F lie in the same horizontal plane and TA represents a vertical tower.

$A\hat{T}K = x$, $K\hat{A}F = 90° + x$ and $K\hat{F}A = 2x$ where $0° < x < 30°$. TK = 2 units.



9.1 Express AK in terms of $\sin x$. (2)

9.2 Calculate the numerical value of KF. (4)

[6]

INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

In ΔABC:

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

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

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

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

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

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

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

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

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