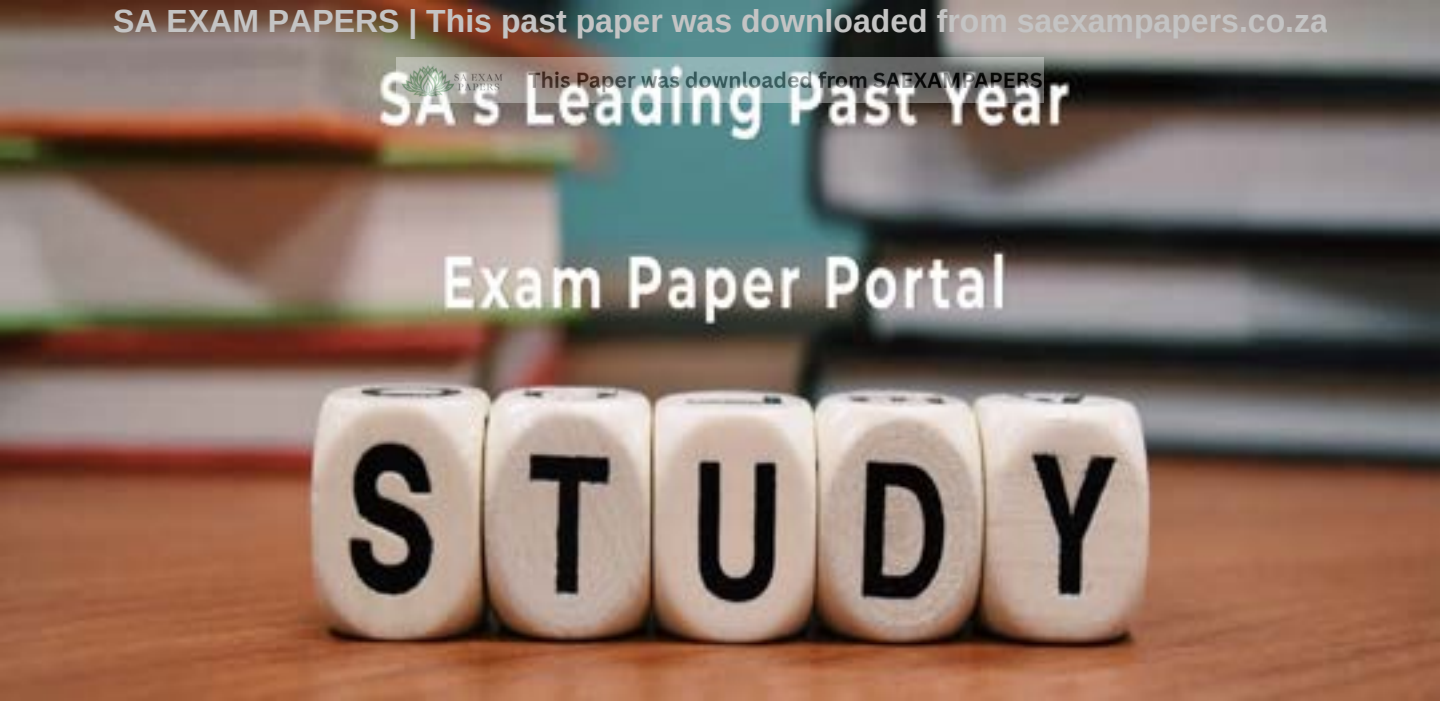


LIMPOPO
PROVINCIAL GOVERNMENT
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF
EDUCATION

NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS P1

JUNE 2025

MARKS: 150

TIME: 3 hours

MEMATHP1

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 8 Questions.
2. Answer **ALL** the questions.
3. Number your answers correctly according to the numbering system used in this question paper.
4. Clearly show **ALL** calculations, diagrams and graphs 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. 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 $x^2 - 121 = 0$ (3)

1.1.2 $x^2 + 3 = 5x$ (Correct to **TWO** decimal places) (4)

1.1.3 $(x-1)(x-5) \leq 12$ (4)

1.1.4 $2^x + 2^{x+2} = 40$ (4)

1.1.5 $\sqrt{10 - x^2} - x + 2 = 0$ (5)

1.2 Solve simultaneously for x and y:

$y - x = 2$

$x^2 + 2xy - 4 = 0$ (5)

1.3 Given: $f(x) = x(x+a) - b$ and $g(x) = 2x^2 + b - dx$, where $a \neq 0$ and $b \neq 0$.

If $x - a$ is a factor of $f(x)$ and if $x - b$ is a factor of $g(x)$,

prove that: $d - 1 = 4a^2$ (5)

[30]

QUESTION 2

2.1 The 19^{th} term of an arithmetic sequence is 11, while the 31^{st} term is 5.

2.1.1 Determine the first 3 terms of the sequence. (5)

2.1.2 Determine the general term of the sequence. (2)

2.1.3 Calculate the sum of the first 81 terms. (3)

2.2 Given the quadratic pattern: 2 ; 5 ; 10 ; 17 ; 26 ; .....

2.2.1 Write down the next TWO terms of the pattern. (2)

2.2.2 Show that $T_n = n^2 + 1$ is the general term of the quadratic pattern. (4)

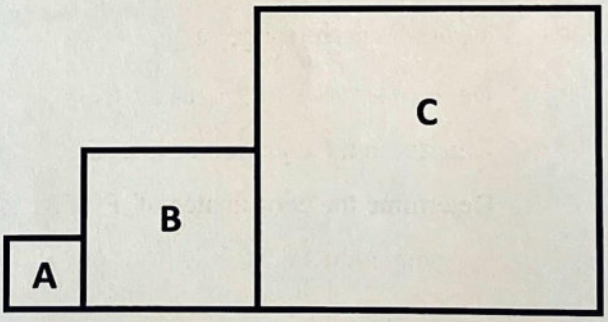
2.2.3 Determine the term of the pattern that has the value of 290. (3)

2.2.4 Between which two consecutive terms of the quadratic pattern will the first difference be 25 ? (5)

[24]

QUESTION 3

Square A has sides 2cm each. The length of the side of square A is half the length of the side of square B, and the length of the side of square C is double the length of the side of square B.



3.1 Determine the length of each diagonal of square A. (2)

3.2 Calculate the area of square C. (2)

3.3 Show that the sum of the areas of the first 10 squares is 1 398 100 (3)

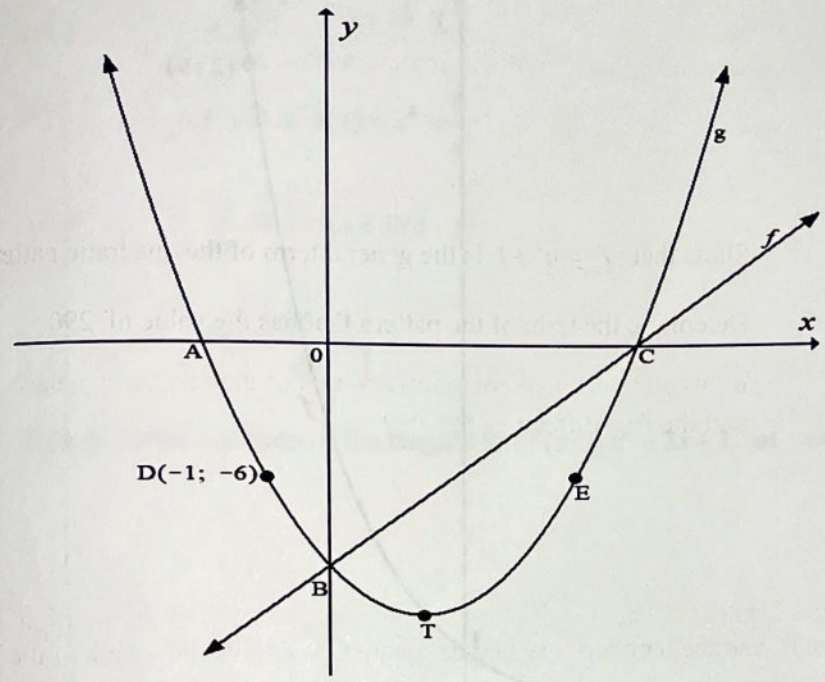
3.4 Show that the length of each diagonal of the n^{th} square is $\sqrt{2}(2)^n$. (4)

3.5 Determine the square which has a diagonal of $256\sqrt{2}$ cm. (4)

[15]

QUESTION 4

4.1 The sketch below shows the graph of $g(x)=x^2-3x-10$. Points A and C are the x – intercepts and T is the turning point of g. Graph f cuts g at points B and C respectively. Point E is symmetrical to point D on the graph of g.



4.1.1 Determine the coordinates of the turning point T. (4)

4.1.2 Write down the range of g. (2)

4.1.3 Determine the coordinates of C. (2)

4.1.4 Determine the equation of line BC. (4)

4.1.5 Determine the coordinates of E, if E is symmetrical with D. (4)

4.1.6 For what value(s) of x will $f(x)>g(x)$. (2)

4.1.7 For what value(s) of x will $x^2-3x-10$ be positive? (2)

4.2 Given: $f(x)=\dfrac{2}{x+1}$

4.2.1 Write down the equations of the asymptotes. (2)

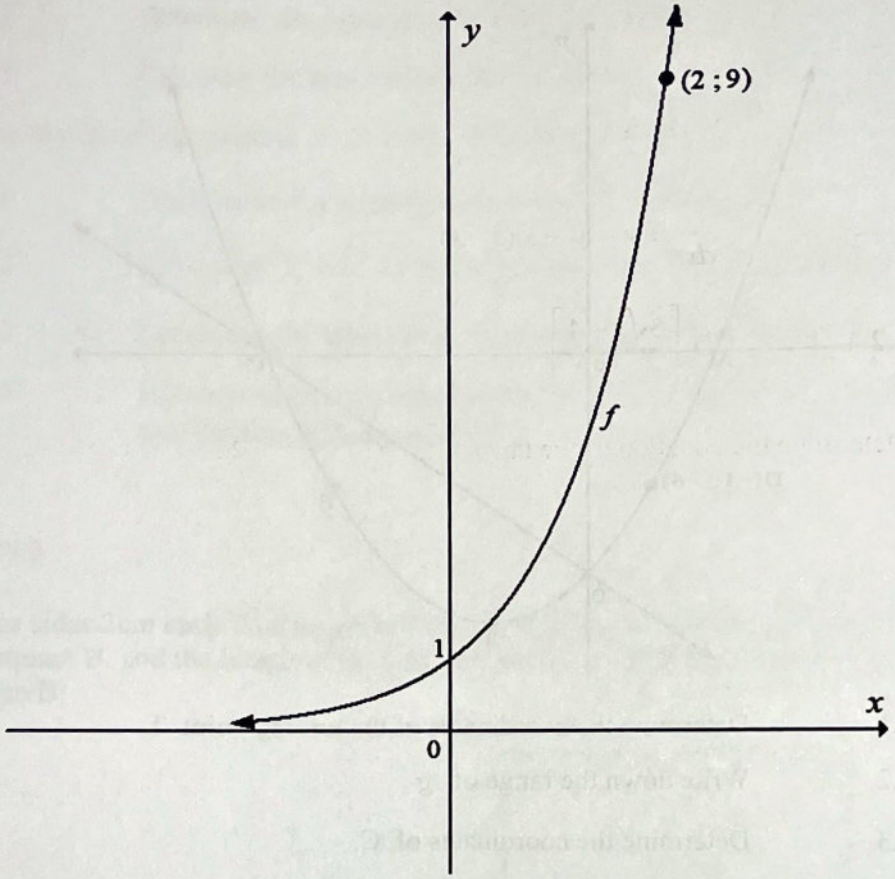
4.2.2 Sketch the graph of f showing intercept with the axes and the asymptotes. (3)

4.2.3 If f is translated to g and $g(x)=\dfrac{2}{x-2}+2$, discuss the translation. (2)

[27]

QUESTION 5

The sketch below represents the graph of $f(x)=b^x+q$ which intersects the y - axis at $(0\ ;\ 1)$ and passes through the point $(2\ ;\ 9)$.



5.1 Show that the equation of $f(x)=3^x$ (3)

5.2 Determine the equation of $f^{-1}(x)$. (2)

5.3 Sketch the graph of $f^{-1}(x)$. Show all intercepts with the axes. (3)

5.4 Given that $g(x)=2x-1$, calculate the value of P if:

$$P=\sum_{x=-2}^{5} f(x)-\sum_{x=1}^{10} g(x)$$ (5)

[13]

QUESTION 6

6.1 Calculate the derivative of $f(x)=3x^2-2x$ from first principles. (5)

6.2 Determine:

6.2.1 $\lim\limits_{h\to 3}\dfrac{2x^2-11x+15}{3-x}$ (3)

6.2.2 $g'(x)$ if $g(x)=x^4-\dfrac{4}{x}$ (3)

6.2.3 $\dfrac{dy}{dx}$ if $y=(x+3)(3-x)$ (3)

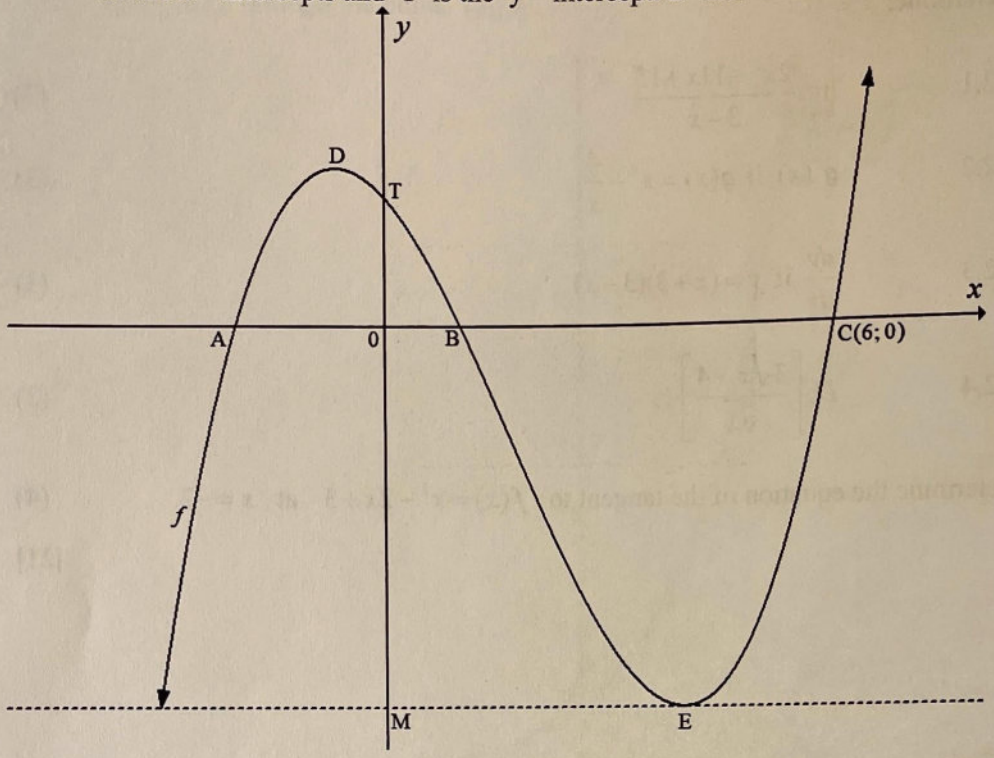
6.2.4 $D_x\left[\dfrac{3\sqrt{x}-4}{\sqrt{x}}\right]$ (3)

6.3 Determine the equation of the tangent to $f(x)=x^2-2x+3$ at $x=-2$. (4)

[21]

QUESTION 7

7.1 The sketch below is defined by $f(x)=x^3-5x^2-8x+12$. Points A, B and C $(6;0)$ are the x – intercepts and T is the y – intercept. D and E are the turning points.



7.1.1 Determine the coordinates of E. (4)

7.1.2 Write down the equation of the tangent, ME to f. (1)

7.1.3 Write down the length of TM if M is on the y – axis. (2)

7.2 $p(x)$ is a cubic function with the following conditions:

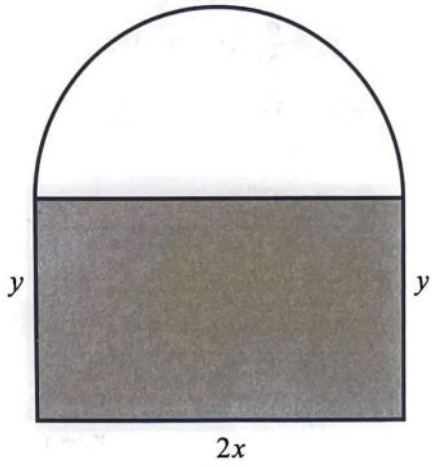
- $p(x)=ax^3+bx^2+cx+d$
- $a<0$
- $p(0)=0$
- $p'(1)=0$ and $p'(3)=0$

Use the given information to draw a neat sketch of graph, showing all intercepts and the turning points. (4)

[11]

QUESTION 8

The figure represents a large stained glass window frame. The upper part of the frame is a semi-circle. The lower part of the frame is a rectangle with sides of $2x$ metres and y metres as shown. The perimeter of the window frame is 30 metres.



8.1 Show that: $y = \dfrac{30 - x(2+\pi)}{2}$ (4)

8.2 Calculate the value of x for which the area of the window frame will be a maximum.

(Leave answer in terms of π) (5)
[9]

TOTAL: 150

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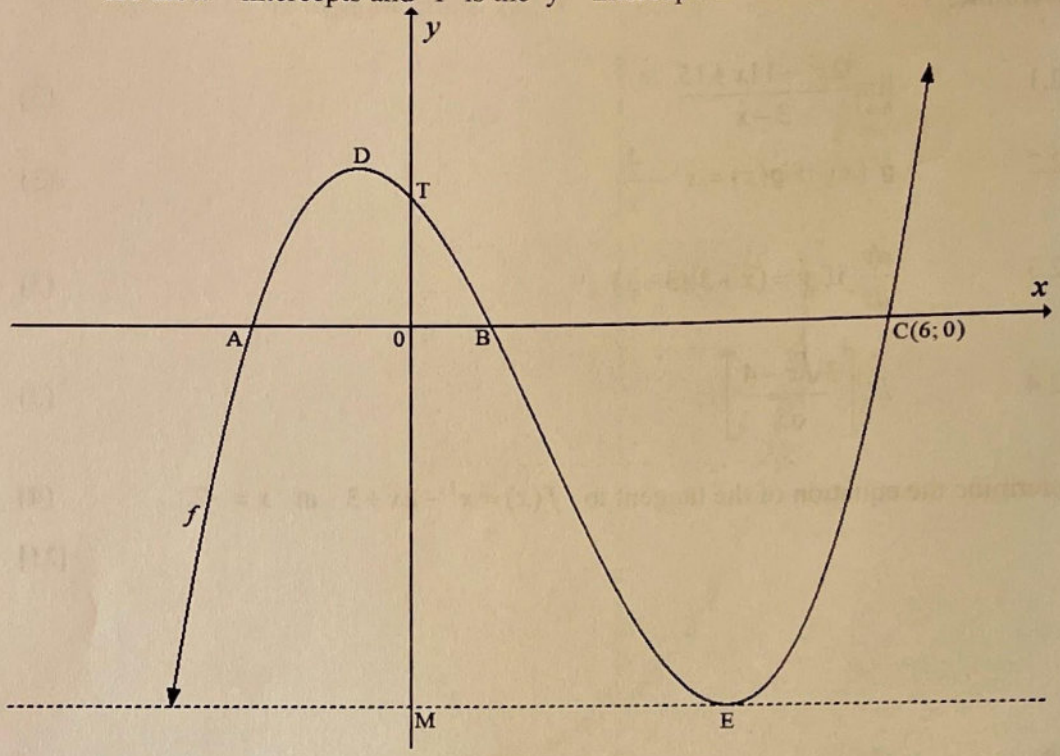

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Use the given information to draw a neat sketch of graph, showing all intercepts and the turning points. (4)

[11]

INFORMATION SHEET

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

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

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

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

$$F = \frac{x\left[(1+i)^n - 1\right]}{i} \qquad P = \frac{x[1-(1+i)^{-n}]}{i} \qquad f'(x) = \lim_{h \to 0} \frac{f(x+h) - f(x)}{h}$$

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

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

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

In ΔABC:

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

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

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

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

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

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

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

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

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