GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

# JUNE EXAMINATION
# GRADE 12

# 2026

## MATHEMATICS

## (PAPER 1)

| | | | | | | | | | | |
|---|---|---|---|---|---|---|---|---|---|---|
| **SURNAME:** | | | | | | | | | | |
| **NAME:** | | | | | | | | | | |
| **NAME OF SCHOOL:** | | | | | | | | | | |
| **DATE:** | **2** | **0** | **2** | **6** | | M | M | | D | D |

**ANSWER ALL THE QUESTIONS IN THE QUESTION PAPER.**

| | MARKER | | | | MODERATOR | | | |
|---|---|---|---|---|---|---|---|---|
| **QUESTION** | **MARKS** | | | **MARKER'S INITIALS** | **MARKS** | | | **MODERATOR'S INITIALS** |
| **1** | 0 | | | | 0 | | | |
| **2** | 0 | | | | 0 | | | |
| **3** | 0 | | | | 0 | | | |
| **4** | 0 | | | | 0 | | | |
| **5** | 0 | | | | 0 | | | |
| **6** | 0 | | | | 0 | | | |
| **7** | 0 | | | | 0 | | | |
| **8** | 0 | | | | 0 | | | |
| **9** | 0 | | | | 0 | | | |
| | | | | **TOTAL** | | | | |

**TIME: 3 hours**

**MARKS: 150**

**30 pages + an information sheet**

## INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 9 questions. Answer ALL the questions in the spaces provided for answers.

2 Clearly show ALL calculations, diagrams, graphs, etc. that you have used in determining your answers.

3. Answers only will NOT necessarily be awarded full marks.

4. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.

5. If necessary, round-off answers to TWO decimal places, unless stated otherwise.

6. Diagrams are NOT necessarily drawn to scale.

7. An INFORMATION SHEET with formulae is included at the end of the question paper.

8. No pages may be torn from the question paper.

9. Candidates may not retain a question paper or remove it from the examination room. Question papers must be returned to the invigilator at the end of the examination session.

10. Answers must be written in black/blue ink as distinctly as possible. DO NOT write in the margins.

11. Indicate the questions that you have answered by drawing a circle around the relevant numbers on the front cover of the question paper where marks are to be recorded.

12. Draw a neat line through any work/rough work that must NOT be marked.

13. In the event that you use the additional space provided:

    13.1 Write down the number of the question.

    13.2 Leave a line and rule off after your answer.

14. Write neatly and legibly.

**QUESTION 1**

| | | | |
|---|---|---|---|
| 1.1 | Solve for $x$: | | |
| | 1.1.1 | $3x^2 - x = 0$ | (2) |
| | 1.1.2 | $2x^2 + 6x = 6$ (Correct to TWO decimal places) | (4) |
| | 1.1.3 | $-x^2 - 2x \leq -8$ | (4) |

1.1.4 $2^{2x} - 2^x = 12$

(4)

1.1.5 $\sqrt{4x-3} = x$

(4)

| | | |
|---|---|---|
| 1.2 | Solve for $x$ and $y$ simultaneously:<br>$4^{2x+1} = 16^{\frac{y}{2}}$<br>$x^{2} - 2xy = -1$ | |
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| | | (6) |

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| 1.3 | Simplify fully, **without using a calculator**.<br>$\sqrt[4]{\frac{4^{1013}-2^{2025}}{2^{2017}}}$ | |
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| | | (4) |
| 1.4 | Determine the values of $p$ for which the roots of the equation $x^2 = px - 1$ are real. | |
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| | | (6) |

**[34]**

## QUESTION 2

The first three terms of a quadratic pattern are:

$-12\ ;\ -15\ ;-16\ ;\ ...$

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|---|---|---|
| 2.1 | Write down the next two terms of the pattern. | (2) |
| 2.2 | Determine the $n^{th}$ term of the pattern and write your answer in the form:<br>$T_n = an^2 + bn + c$ | (4) |

| | | |
|---|---|---|
| 2.3 | Determine, which terms of the pattern are positive. | |
| | | (4) |

| | | |
|---|---|---|
| 2.4 | Which TWO consecutive terms in the quadratic number pattern have a first difference of 113? | |
| | | (4) |

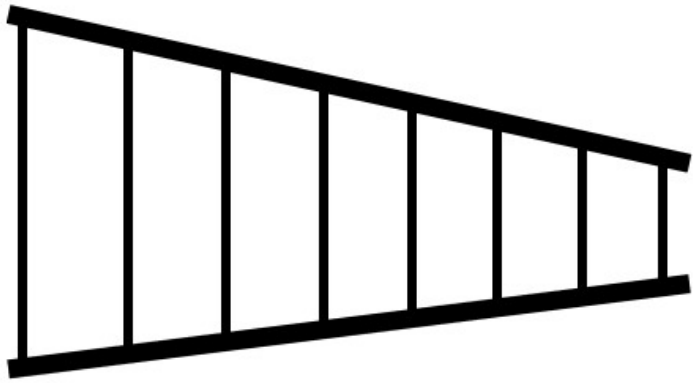
**[14]**

**QUESTION 3**

| | | |
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| 3.1 | Given the arithmetic sequence: $5\ ;\ 9\ ;13\ ;\ldots;1001$. Determine the number of terms in the sequence. | |
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| 3.2 | Prove that for any arithmetic sequence with first term $a$, and a common difference $d$, the sum of the first $n$ terms is given by the formula: $S_n = \frac{n}{2}[2a + (n-1)d]$. | |
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| 3.3 | Evaluate:<br>$\sum_{p=-1}^{19}(3p-2)$ | |
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| 3.4 | A metal rod of 15, 9375 metres is cut into eight pieces whose lengths form a geometric sequence. The pieces are then used to support a structure. The pieces are welded vertically, starting with the longest piece, to support two metal beams as shown in the diagram below. The length of the longest piece is 128 times the length of the shortest piece. | | |
| |  | | |
| | If the length of the shortest piece, the $8^{th}$ piece, is $x$ metres: | | |
| | 3.4.1 | Write down the length of the longest piece in terms of $x$. | |
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| | | | (1) |

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| | 3.4.2 | Determine the common ratio of the sequence formed by the pieces of the rod. | |
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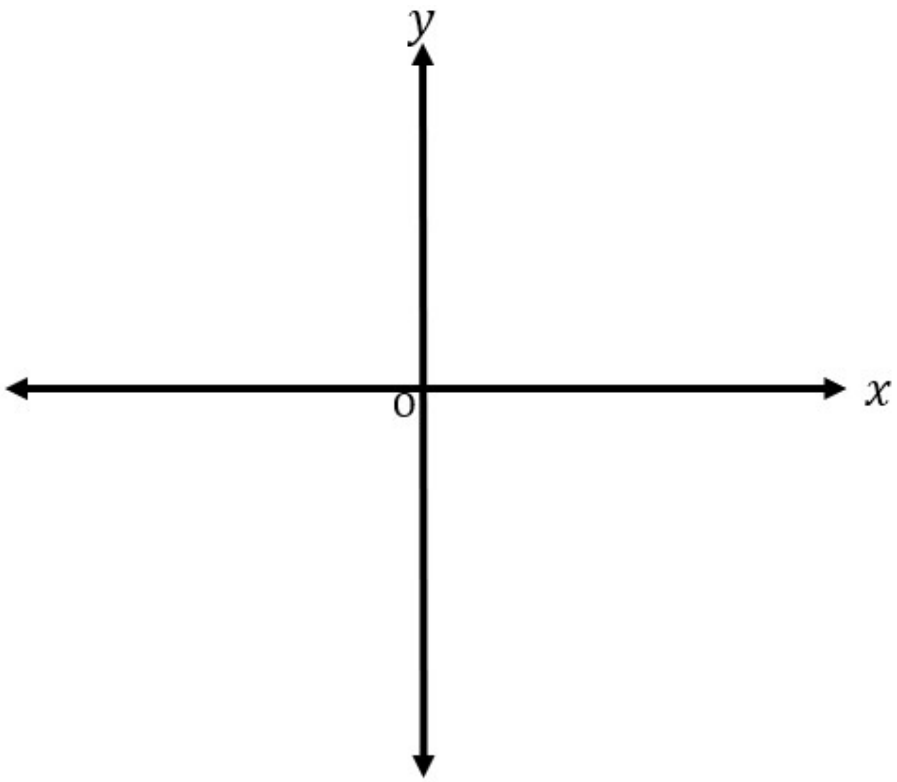
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|---|---|---|---|
| | 3.4.3 | Hence, determine the length of the longest piece of the rod. | |
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**[20]**

**QUESTION 4**

Given: $f(x) = \left(\frac{1}{3}\right)^x$

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|---|---|---|
| 4.1 | Determine the inverse of graph $f$ and write your answer in the form $y = \cdots$ | (2) |
| 4.2 | Sketch the graph of $f$ and $f^{-1}$. Show intercept(s) with axes and at least ONE other point on each graph. | (6) |



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| 4.3 | Determine the values of $x$ for which $f^{-1}(x) > -3$. | |
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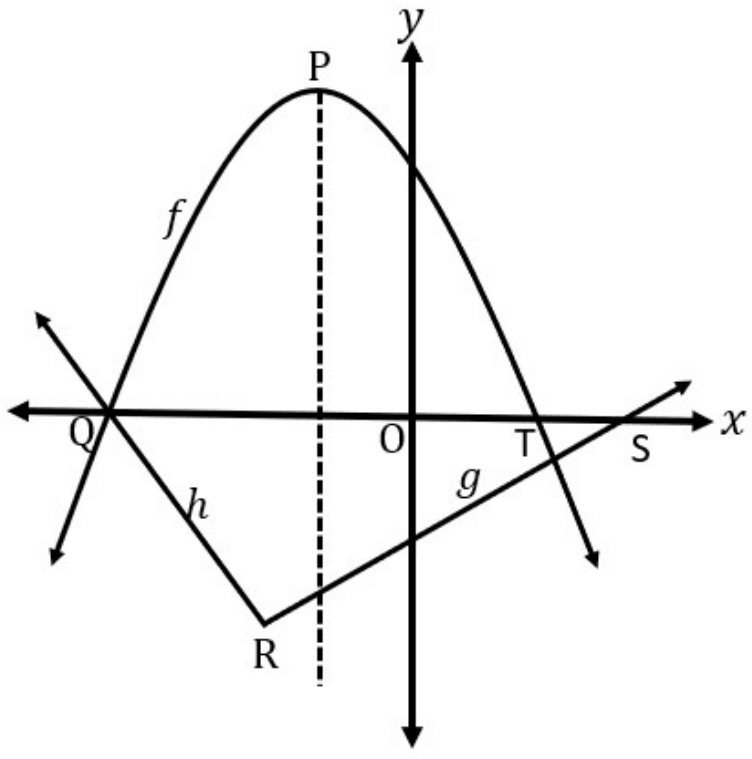
**[10]**

**QUESTION 5**

The graphs of $f(x) = -x^2 - 6x + 7$, $g(x) = \frac{1}{2}x - 4$ and $h(x) = -2x - 14$ are sketched below.

Graph $f$ cuts the $x$-axis at points Q and T. Graphs $g$ and $h$ meet at point R.

The $x$-intercepts of graphs $g$ and $h$ are S and Q respectively. P is the turning point of graph $f$.

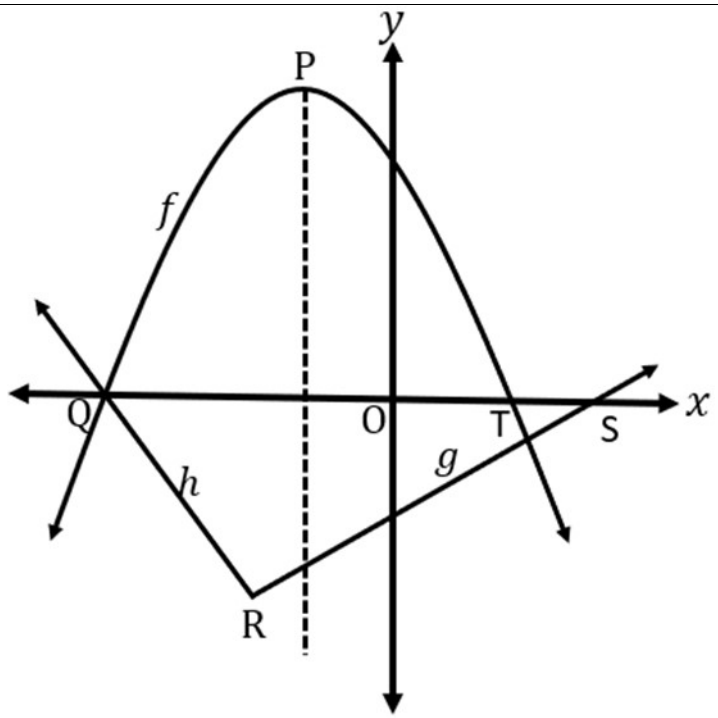


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|---|---|---|
| 5.1 | Show, with necessary calculations, that graphs $g$ and $h$ are perpendicular to each other. | |
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| 5.2 | Determine the coordinates of R. | |
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| 5.3 | Determine the length of QT. | |
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5.4 $w(x)$ is the equation of the line obtained by shifting graph $g$ perpendicularly along graph $h$ until it reaches point Q.



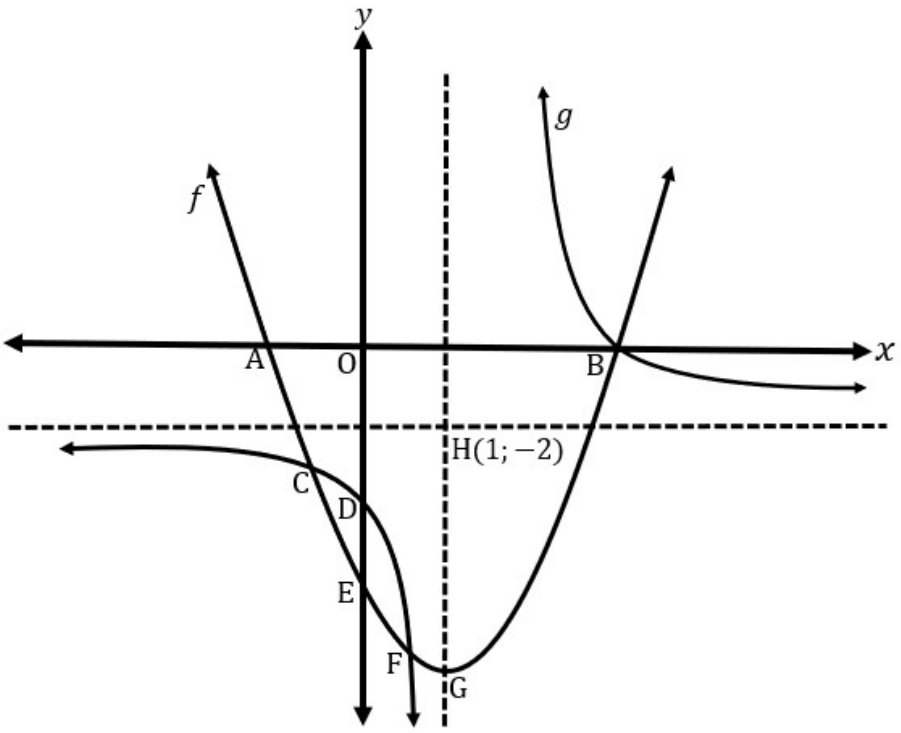

5.4.1 Determine the $y$-intercept of graph $w$. (2)

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| | 5.4.2 | If graph $w$ meets the line of symmetry of graph $f$ at point M (not shown in the sketch), determine PM. | |
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**[14]**

**QUESTION 6**

The graphs of $f(x) = x^2 - 2x - 15$ and $g(x) = \frac{a}{x+p} + q$ are sketched below. The asymptotes of graph $g$ intersect at point H$(1; -2)$. Graph $f$ cuts the $x$-axis at points A and B, and intersects the $y$-axis at point E. Graphs $f$ and $g$ intersect at points B, C and F. The turning point G, of graph $f$ lies on the vertical asymptote of graph $g$.




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| 6.1 | Write down the coordinates of point E. | |
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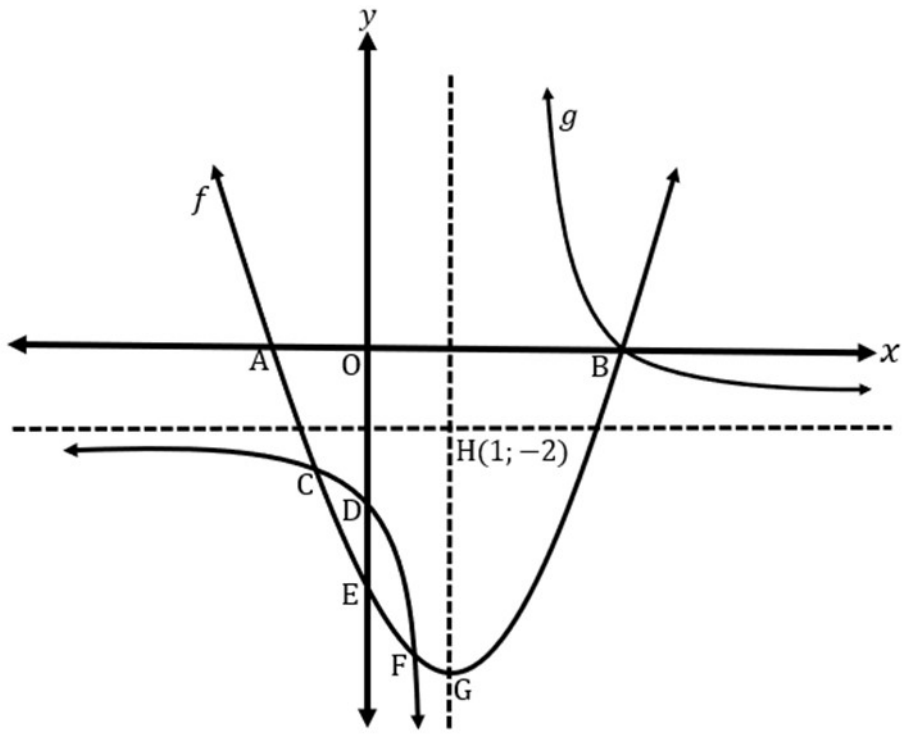
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| 6.2 | Determine the coordinates of B. | (3) |

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| 6.3 | Determine the range of graph $f$. | (2) |

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|---|---|---|---|
| 6.4 | Consider graph $g(x) = \frac{a}{x+p} + q$: | | |
| | 6.4.1 | Write down the values of $p$ and $q$. | (2) |

| | | | |
|---|---|---|---|
| | 6.4.2 | Show that $a = 8$. | (3) |

| | | | |
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| | 6.4.3 | Hence, determine the equation of the axis of symmetry of $g$ with a negative gradient. | |
| | | | (2) |



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| 6.5 | If it is further given that the $x$ values at C and F are $x = -2{,}41$ and $x = 0{,}41$ respectively, determine the values of $x$ for which $g(x) - f(x) > 0$. | |
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| 6.6 | If $h(x) = -2x + k$ is a straight line drawn on the same set of axes as $f$ and $g$, determine the values of $k$ for which graphs $g$ and $h$ will NOT intersect. | |
| | | (5) |

**[21]**

**QUESTION 7**

| | | |
|---|---|---|
| 7.1 | Determine $f'(x)$ from first principles if $f(x) = 4x^2 - 3x$. | (5) |
| 7.2 | Determine:<br>$D_x\left[\frac{x^2 - 9}{3 - x}\right]$ | (3) |

| | | |
|---|---|---|
| 7.3 | Given that $y = (2x - 3)^2$, show that $\frac{dy}{dx} = 4\sqrt{y}$. | |
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| | | (4) |

**[12]**

**QUESTION 8**

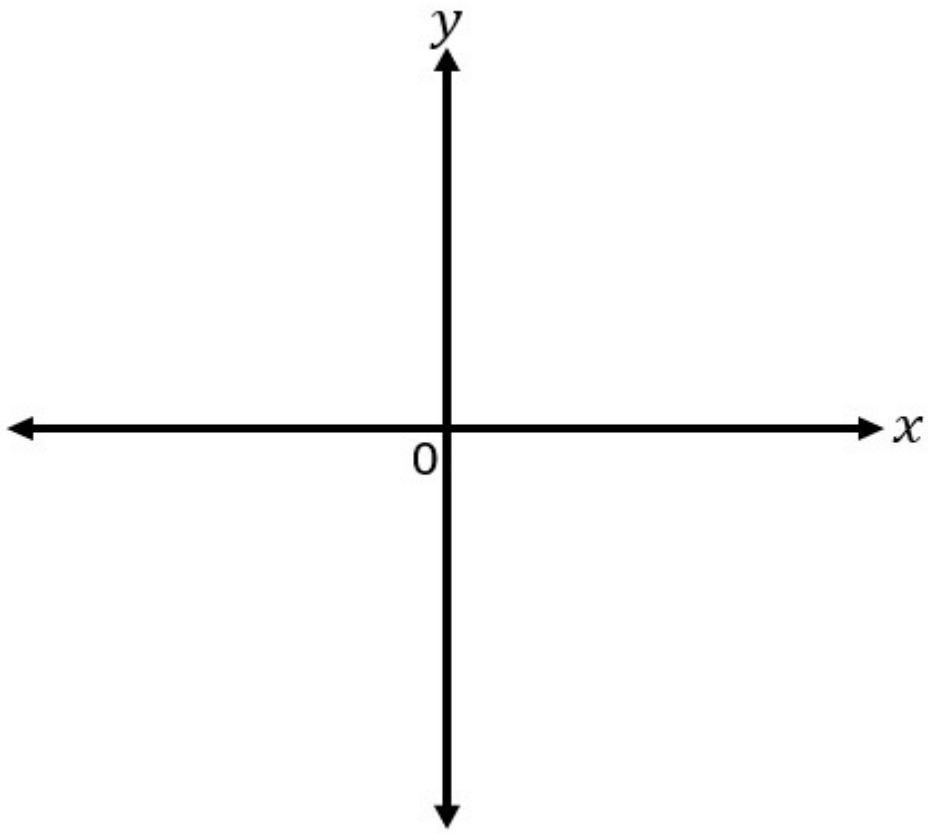
Given: $f(x) = x^3 - 3x^2 + 4$

8.1 Determine the coordinates of the intercepts of $f$ with the axes.

(5)

8.2 Calculate the coordinates of the turning points of $f$.

(4)

| | | |
|---|---|---|
| 8.3 | Draw a neat sketch of $f$ and clearly label all the intercepts with the axes and the turning points. | |
| |  | (4) |

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| 8.4 | For which values of $x$ will $f$ be concave up? | |
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| | | (2) |

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| 8.5 | Use your graph in QUESTION 8.3 to determine the values of $p$ for which $f(x) = x^3 - 3x^2 + 4 + p$ will have one distinct root. | |
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| | | (2) |

**[17]**

**QUESTION 9**

A school fundraising committee is planning a matric dance for the Grade 12 learners. The weekly profit $P$, in rand, depends on the number of teachers involved in the fundraising activities. The relationship between profit and the number of teachers is given by the formula:

$P(x) = -2x^2 + 160x + 19\,600$, where $x$ is the number of teachers.

| | | |
|---|---|---|
| 9.1 | Determine the profit when 5 teachers are involved in the fundraising. | (2) |
| 9.2 | Calculate the number of teachers that would need to be involved in the fundraising activities to achieve a maximum profit. Show ALL your working. | (4) |
| 9.3 | Determine the maximum profit that the committee can make. | (2) |

**[8]**

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**TOTAL: 150**

**END**

# INFORMATION SHEET: MATHEMATICS

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

$$A = P(1+in)$$

$$A = P(1-in)$$

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

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

$$\sum_{i=1}^{n} 1 = n$$

$$\sum_{i=1}^{n} i = \frac{n(n+1)}{2}$$

$$T_n = a + (n-1)d$$

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

$$T_n = ar^{n-1}$$

$$S_n = \frac{a(1-r^n)}{1-r};\ r \neq 1$$

$$S_\infty = \frac{a}{1-r};\ -1 < r < 1$$

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

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

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

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M\left(\frac{x_1 + x_2}{2}; \frac{y_1 + y_2}{2}\right)$$

$$y = mx + c$$

$$y - y_1 = m(x - x_1)$$

$$m = \frac{y_2 - y_1}{x_2 - x_1}$$

$$m = \tan\theta$$

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

In $\Delta ABC$: $\frac{a}{sinA} = \frac{b}{sinB} = \frac{c}{sinC}$

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

$$\text{Area of } \Delta ABC = \frac{1}{2}ab.\sin C$$

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

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

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

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

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

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

$$\bar{x} = \frac{\sum x}{n}$$

$$\sigma^2 = \frac{\sum_i^n (x_i - \bar{x})^2}{n}$$

$$P(A) = \frac{n(A)}{n(S)}$$

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

$$\hat{y} = a + bx$$

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

GAUTENG PROVINCE
EDUCATION
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# JUNE EXAMINATION GRADE 12

# 2026

## MATHEMATICS

## (PAPER 1)

**MATHEMATICS P1**

C2611E

X05