education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT

GRADE 12

MATHEMATICS P1
JUNE 2024

MARKS: 150

TIME: 3 hours

This question paper consists of 8 pages and 1 information sheet.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 10 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 that 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, round off answers to TWO decimal places, unless stated otherwise.
8. Diagrams are NOT necessarily drawn to scale.
9. Write neatly and legibly.

QUESTION 1

1.1 Solve for x:

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

1.1.2 $x(3x-7)=4$ (correct to TWO decimal places) (4)

1.1.3 $x+\sqrt{x-3}=15$ (5)

1.1.4 $x^2+x-12>0$ (4)

1.2 Solve for x and y simultaneously:

$3x-y=1$ and $x^2+2xy=3y^2-7$ (6)

1.3 If $\sqrt[a]{2}=3$; $\sqrt[b]{3}=5$ and $\sqrt[c]{5}=8$, determine the value of $a\times b\times c$. (4)

[25]

QUESTION 2

2.1 Given a quadratic number pattern: $19;\ 8;\ -1;\ -8;\ .\ .\ .$

2.1.1 Determine the next term of the pattern. (1)

2.1.2 Determine the general term of the quadratic number pattern. (4)

2.1.3 Determine the difference between the 25^{th} and the 26^{th} terms of the quadratic number pattern. (3)

2.1.4 Calculate the value of the smallest term in the quadratic pattern. (3)

2.2 Given the arithmetic sequence: $3;\ b;\ 13;\ 18;\ .\ .\ .$

2.2.1 Write down the value of b. (2)

2.2.2 Determine the n^{th} term of the sequence. (2)

2.2.3 Calculate the sum of the first 30 terms in the sequence. (2)

2.3 Given: $2^x+2^{x+1}+3.2^x+2^{x+2}+\ .\ .\ .\ (15\ terms)=k.2^{x+p}$

Determine the values of k and p for which $k,\ p\in\mathbb{Z}$ and k is an odd number. (4)

[21]

QUESTION 3

3.1 Given the geometric series:

$$-4 + 2 - 1 + ... + \frac{1}{32}$$

3.1.1 Write down the general term of this series. (2)

3.1.2 Write the series in sigma notation. (2)

3.1.3 Calculate the sum to infinity of this series. (2)

3.2 Given: $S_n = 32 - 32\left(\frac{1}{2}\right)^n$.

3.2.1 Determine S_5. (1)

3.2.2 How many terms must be added for the sum to be equal to $\frac{255}{8}$? (3)

3.2.3 If $2^n = p$, determine the value of $S_{5-n} - S_{5+n}$ in terms of p. (3)
[13]

QUESTION 4

Given: $h(x) = \frac{-6}{x+3} - 2$

4.1 Write down the equations of the asymptotes of h. (2)

4.2 Sketch the graph of h. Clearly label ALL the intercepts with the axes and the asymptotes on your graph. (4)

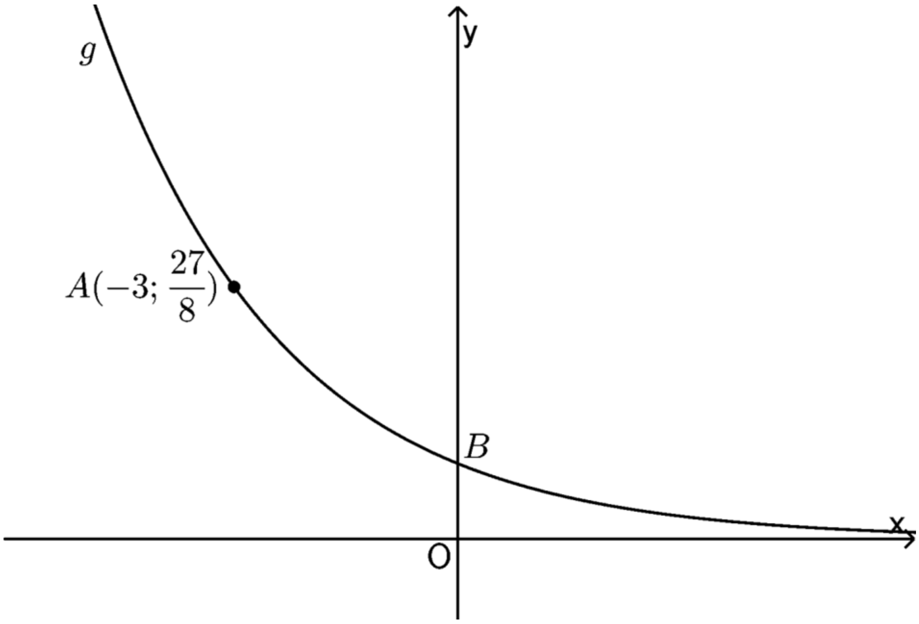
4.3 Determine the equation of the line of symmetry of h for $m > 0$. (2)

4.4 Write down the range of $h(x)$. (2)

4.4 For which values of x will $h(x) \geq 0$? (2)
[12]

QUESTION 5

Given: $g(x) = a^x$. A$\left(-3; \frac{27}{8}\right)$ is a point on g and B is the y-intercept.



5.1 Write down the coordinates of B. (2)

5.2 Determine the value of a. (2)

5.3 Determine the equation of h if h is the reflection of g in the y-axis. (2)

5.4 Write down the equation of $h^{-1}(x)$, the inverse of h, in the form $y = . . .$ (2)

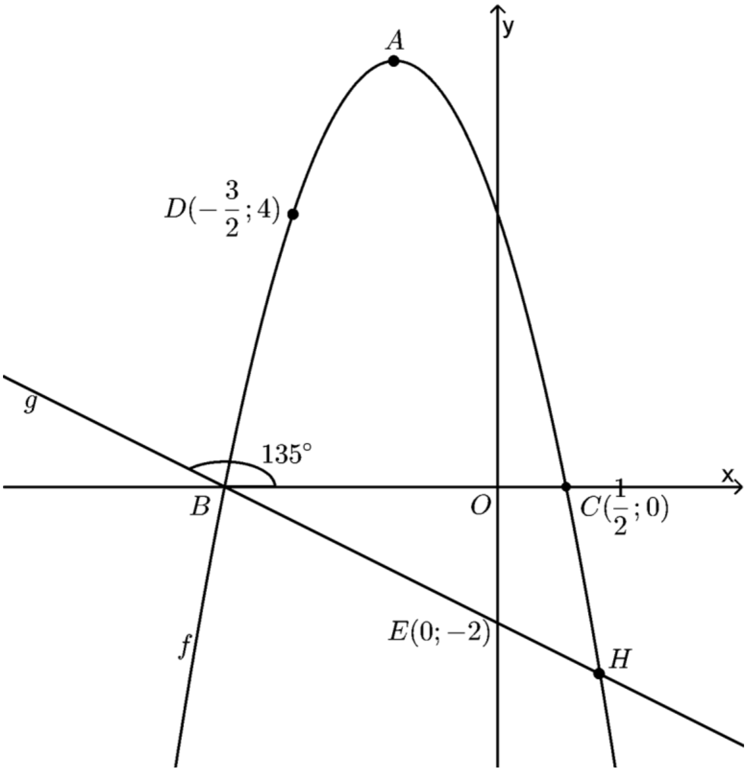
5.5 For which values of x will $h^{-1}(x) \leq 1$? (2)

5.6 Write down the domain of $h^{-1}(x - 3)$. (2)

[12]

QUESTION 6

The graphs of $f(x) = ax^2 + bx + c$ and $g(x) = mx + q$ are drawn below. The graphs intersect at B and H. B is also the x-intercept of f and g. $C\left(\frac{1}{2};\ 0\right)$ is also a x-intercept of f. $D(-\frac{3}{2}; 4)$ is a point on f. A is the turning point of f. $E(0;\ -2)$ is the y-intercept of g. The angle of inclination of g with the positive x-axis is $135°$.



6.1 Show that the equation of $g(x) = -x - 2$. (2)

6.2 Write down the coordinate of B. (2)

6.3 Show that the equation of $f(x) = -4x^2 - 6x + 4$. (4)

6.4 Determine the coordinate of A, the turning point of f. (3)

6.5 Determine the coordinate of H. (4)

6.6 For which values of x will $f'(x).g'(x) < 0$? (2)

6.7 Use the graph of f to determine the value(s) of k for which $f(x) = k$ will have two unequal negative roots. (2)

6.8 After f is reflected about the y-axis and then moved downward so that the x-axis is a tangent to h, $h(x)$ is formed.
Write down the new coordinate for D. (2)

[21]

QUESTION 7

7.1 Determine $f'(x)$ from first principles if $f(x) = x^2 + 4x + 1$. (5)

7.2 Determine:

7.2.1 $f'(x)$ if $f(x) = -3x^4 + 5x^2$ (2)

7.2.2 $\frac{dy}{dx}$ if $y = \sqrt{x} - \frac{2}{x}$ (4)

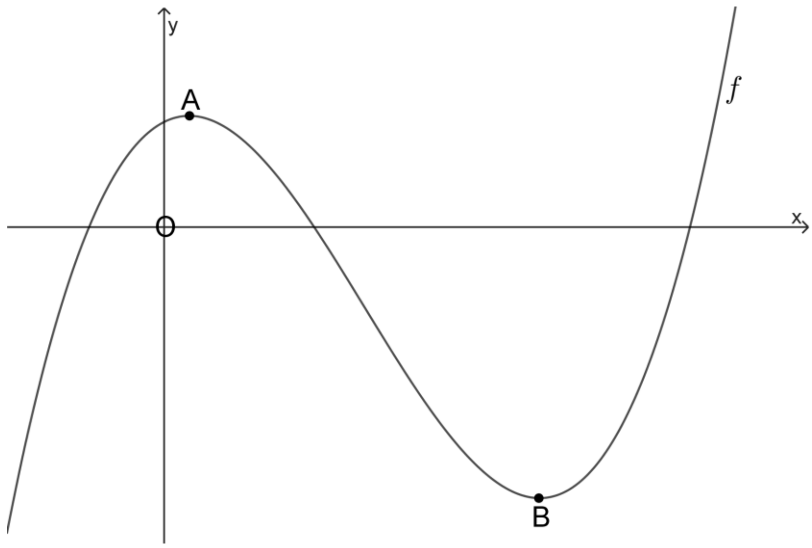
7.3 Determine the equation of the tangent to the curve of $h(x) = -x^3 + 2x - 5$ at $x = -2$. (4)

7.4 The graph $y = g'(x)$ has a minimum turning point at $(1; -4)$. Determine the values of x for which g is concave up. (2)

[17]

QUESTION 8

Given: $f(x) = x^3 - 8x^2 + 5x + 14$



8.1 Write down the y-intercept of f. (1)

8.2 Show that $(x - 7)$ is a factor of f. (2)

8.3 Hence, factorise $f(x)$ completely. (4)

8.4 Determine the coordinates of the turning points A and B. (6)

8.5 Find the coordinates of the point where the concavity of the graph changes. (3)

[16]

QUESTION 9

Draw a graph of f if $f(x) = (x+p)^2(x-q)$ and

- $f(6) = 0$
- $f'(0) = f'(4) = 0$
- $f'(x) < 0$ for $0 < x < 4$
- $f'(x) > 0$ for $x < 0$ or $x > 4$
- $f(2) = -16$

[4]

QUESTION 10

A stone is thrown upward and its height after t seconds is given by equation $h = 18t - 4t^2$ metres.

10.1 Determine the height of the stone after 2 seconds. (2)

10.2 Determine the velocity of the stone after $1\frac{1}{2}$ seconds. (3)

10.3 What is the maximum height that the stone will reach ? (4)

[9]

TOTAL: 150

INFORMATION SHEET: MATHEMATICS

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

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

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

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

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

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

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

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

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

In ΔABC: $\frac{a}{\sin A} = \frac{b}{\sin B} = \frac{c}{\sin C}$ $\quad a^2 = b^2 + c^2 - 2bc.\cos A$

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

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

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

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

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

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

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