education

Department:
Education
North West Provincial Government
REPUBLIC OF SOUTH AFRICA

PROVINCIAL ASSESSMENT

GRADE 11

TECHNICAL MATHEMATICS P1
NOVEMBER 2024

MARKS: 150

TIME: 3 hours

This question paper consists of 8 pages, 1 answer sheet and a 2-page information sheet.

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INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of SEVEN questions.
2. Answer ALL the questions.
3. Answer QUESTION 5.4 on the ANSWER SHEET provided. Write your name and surname in the space provided on your ANSWER SHEET and hand in the ANSWER SHEET with your ANSWER BOOK.
4. Number the answers correctly according to the numbering system used in this question paper.
5. Clearly show ALL calculations diagrams graphs etc. that you have used in determining your answers.
6. Answer only will NOT necessarily be awarded full marks.
7. You may use an approved scientific calculator (non-programmable and non-graphical), unless stated otherwise.
8. If necessary, round off answers to TWO decimal places, unless stated otherwise.
9. Diagrams are NOT necessary drawn to scale.
10. Information sheet with formulae is included at the end of the question paper.
11. Write neatly and legibly.

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QUESTION 1

1.1 Simplify the following **without the use of a calculator**.

1.1.1 $\left(\frac{1}{81}\right)^{\frac{1}{4}}$ (2)

1.1.2 $\frac{\sqrt{48}-\sqrt{12}}{\sqrt{75}}$ (3)

1.1.3 $\frac{9^{x-1}.3^{5x}}{81^{x-1}.27^{x}}$ (5)

1.1.4 $\frac{3^{n+1}+4.3^{n-1}}{3^{n+1}+3^{n}}$ (4)

1.1.5 $\frac{\log 4}{3\log 64}$ (3)

1.1.6 $\log_2 8+\log_x x^2-\log 1000$ (5)

1.2 Prove that: $\frac{\log_x 64+\log_x 4-\log_x 8}{\log_x 512}=\frac{5}{9}$ (4)

1.3 Given: $x=999999999$

Determine the exact value of $\frac{x^2-4}{x-2}$. Show ALL your calculations. (3)

[29]

QUESTION 2

2.1 Solve for x:

2.1.1 $5^x+5^{x+1}=30$ (4)

2.1.2 $3^x=5$ (3)

2.1.3 $x^{\frac{3}{2}}=125$ (3)

2.1.4 $\sqrt{x+2}=x$ (4)

2.1.5 $\log_2 x+\log_2(x-3)=2$ (5)

2.2 Given: $A = P(1+i)^n$

2.2.1 Make n the subject of formula (3)

2.2.2 Hence, how long will it take for Mr Molefe to have amount of $R15000$, if he invested $R8400$ at compound interest rate of $7,5\%$ p.a. (3)

2.2.3 If $x = \log 2$ and $y = \log 3$. Determine $\log 6$ in terms of x and y. (3)
[28]

QUESTION 3

3.1 Solve for x:

3.1.1 $(x+2)(x-3) = 0$ (2)

3.1.2 $x^2 - 5x = -4$ (3)

3.1.3 $x(x-3) = 3$ (correct your answer to TWO decimal) (5)

3.1.4 $-2x^2 + 5x + 12 \geq 0$ (5)

3.1.5 $\dfrac{x-1}{x+1} = \dfrac{x-1}{3}$ (5)

3.2 Solve for x and y simultaneously in the following equations:

$y - x = 3$ and $x^2 + y = -1 - 4x$ (6)

3.3 The sum of three consecutive odd numbers is 45. Determine the smallest number. (3)
[29]

QUESTION 4

Given: $y = 2x^2 - 3x + 5$

4.1 Determine the numerical value of the discriminant. (3)

4.2 Hence, describe the nature of the roots of f.
(1)

4.3 Determine for which values of p the equation $4x^2 - x + p = 0$ will have equal roots. (3)
[7]

QUESTION 5

Given: $f(x)=\frac{2}{x}-1$ and $x^2+y^2=9$

5.1 Determine the equation of the asymptotes of f. (2)

5.2 Determine the x-intercept of f. (3)

5.3 Determine the radius of the circle. (1)

5.4 Sketch the circle and the graph of f on the same set of axes. Indicate all asymptote and the intercept with axes. (5)

5.5 Write down:

(a) The equation of line of symmetry of f, with positive gradient. (1)

(b) The range of f. (2)

(c) The domain of the circle. (2)

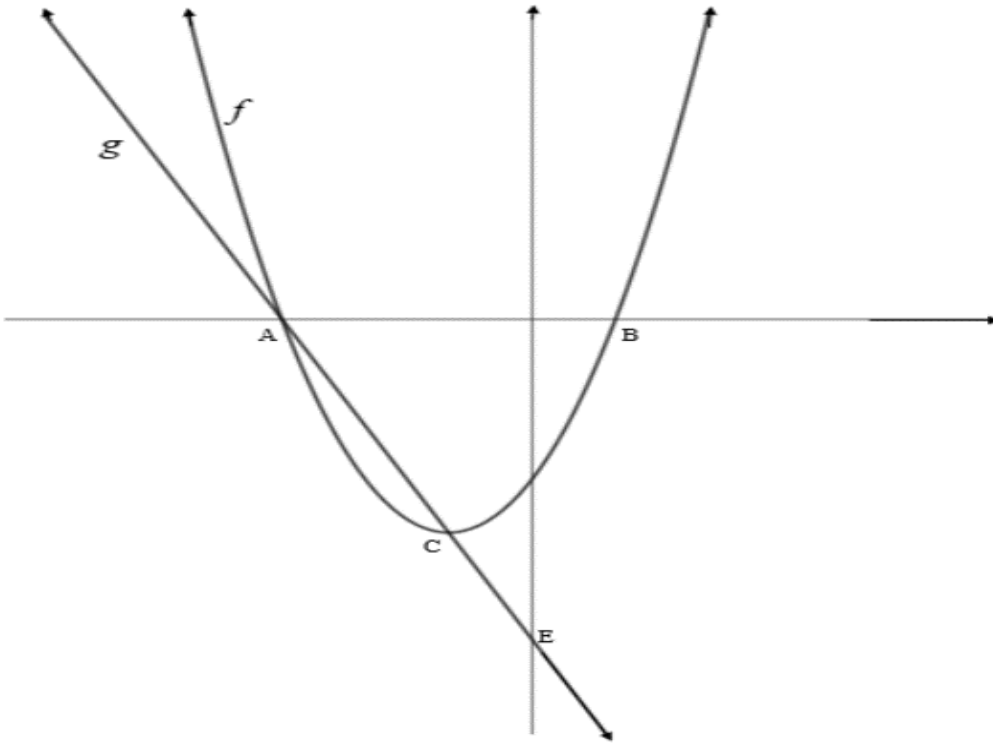
5.6 If the graph of f is moved 2 units downwards. Determine the equation of the new asymptote. (1)
[17]

QUESTION 6

6.1 Sketched below are the graph of function f and g defined by :

$f(x) = x^2 + 2x - 3$ and $g(x) = mx + c$

- With g passing through A, C and E.
- A and B x-intercept of f.
- E is the y-intercept of g.



Determine:

6.1.1 The coordinate of C, the turning point of f. (4)

6.1.2 The coordinates of A and B. (4)

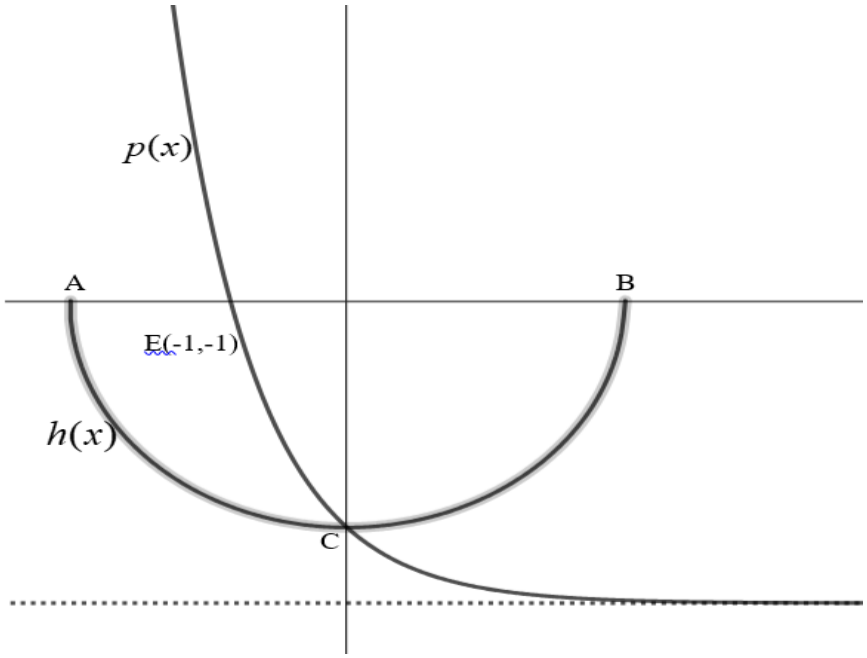
6.1.3 The coordinates of y-intercept of f. (1)

6.1.4 The numerical value of m and c. (4)

6.1.5 The length of CE. (2)

6.2 The graphs below represent the function p defined by $p(x) = a^x - 4$ and semicircle h defined by: $h(x) = -\sqrt{r^2 - x^2}$.

- O is the origin
- C is the y -intercept of h
- Distance OC is 3 units
- Function p has horizontal asymptote passing through D
- A and B are x -intercepts of h
- E is a point on p



6.2.1 Determine the length of AB. (2)

6.2.2 Determine the equation of h . (2)

6.2.3 Is the graph of p a decreasing or increasing graph? (1)

6.2.4 Determine the numerical value of a . (3)

6.2.5 A new graph is defined by $k(x) = p(x) + 2$. Determine the equation of $k(x)$ (2)

[25]

QUESTION 7

7.1 $R35\,000$ is invested at an interest rate of $8,6\%$ per annum, compounded monthly. Determine the value of the investment at the end of 7 years. (3)

7.2 The nominal interest rate charge is $7,5\%$ per annum, compounded quarterly. Calculate the annual effective interest rate charged. (3)

7.3 The value of the property increased from $R155\,000$ to $R222\,392,32$ over 5 years. Calculate the annual simple interest rate of increase over 5 years. (4)

7.4 Oarabile invested $R20\,000$ for 6 years. He earns $12,5\%$ interest rate per annum, compounded monthly for the first two years. After that the interest rate changed to $9,8\%$ per annum, compounded quarterly for the rest of the investment.

Determine the amount that he would have saved at the end of the investment period. (5)
[15]

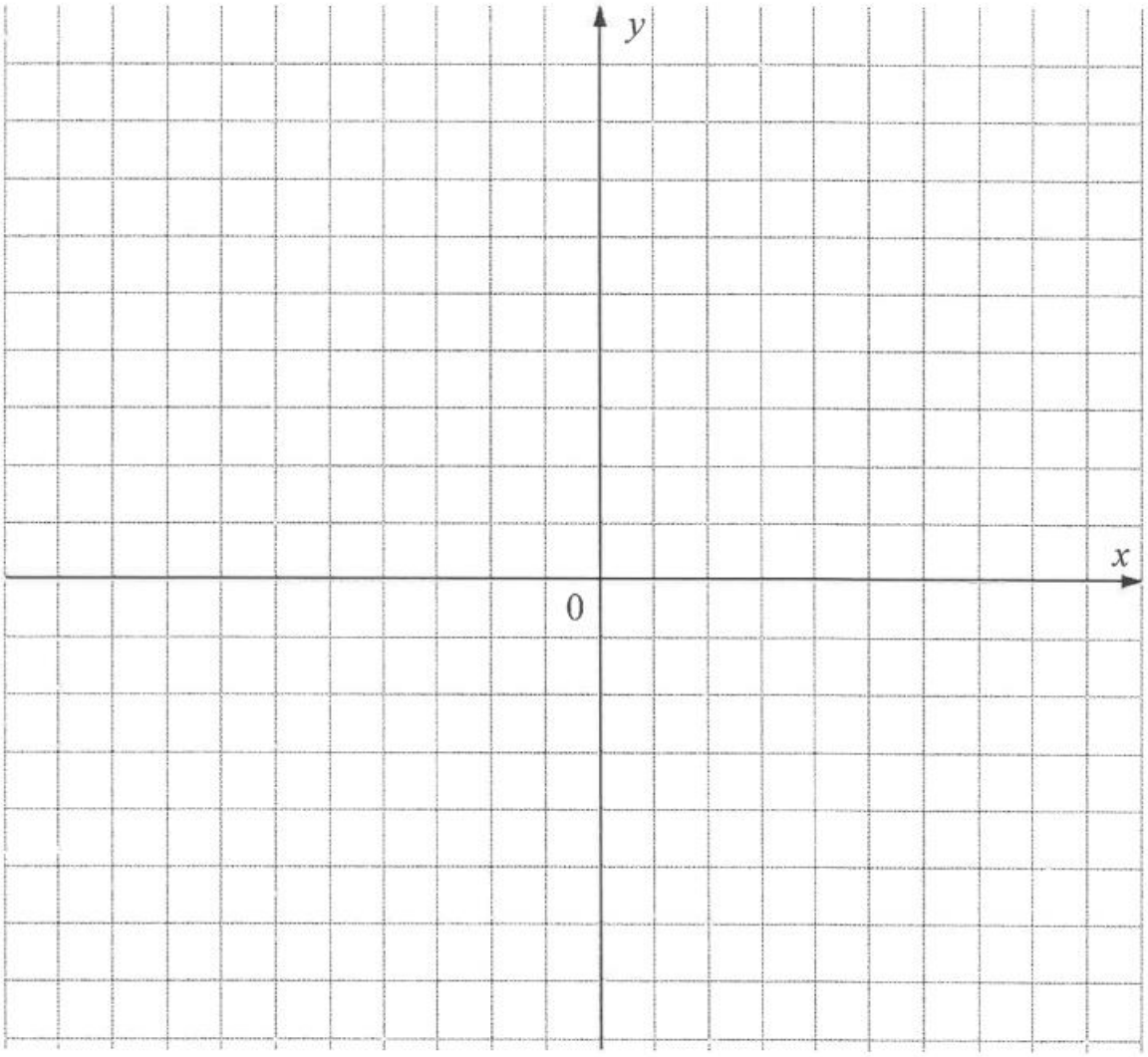
TOTAL: 150

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ANSWER SHEET

NAME AND SURNAME: _____

QUESTION 5.4



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INFORMATION SHEET: TECHNICAL MATHEMATICS

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

$$a^x = b \Leftrightarrow x = \log_a b, \ a > 0, \ a \neq 1 \text{ and } b > 0$$

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

$$i_{eff} = \left(1 + \frac{i}{m}\right)^m - 1$$

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

$$\int kx^n dx = \frac{kn^{n+1}}{n+1} + C \quad , n, k \in \mathbb{R} \text{ with } n \neq -1 \text{ and } k \neq 0$$

$$\int \frac{k}{x} dx = k \ln x + C \quad , x > 0 \text{ and } k \in \mathbb{R}; k \neq 0$$

$$\int ka^{nx} dx = \frac{ka^{nx}}{n \ln a} + C \ , a > 0, a \neq 1 \text{ and } k, a \in \mathbb{R}; k \neq 0$$

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

$$\frac{x^2}{a^2} + \frac{y^2}{b^2} = 1$$

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

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

$$\sin^2\theta + \cos^2\theta = 1 \qquad 1 + \tan^2\theta = \sec^2\theta \qquad 1 + \cot^2\theta = \cos ec^2\theta$$

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$\pi rad = 180°$

Angular velocity $= w = 2\pi n$ where $n =$ rotation frequency

Angular velocity $= 360°$ where $n =$ rotation frequency

Circumferential velocity $= v = \pi Dn$ where $D =$ diameter and $n =$ rotation frequency

Area of a sector $= \frac{rs}{2}$ where $r =$ radius, and $s =$ arc length

Area of a sector $= \frac{r^2\theta}{2}$ where $r =$ radius, and $\theta =$ central angle

in radians

$4h^2 - 4dh + x^2 = 0$ where $h =$ height of segment, $d =$ diameter of circle and $x =$ length of chord

$A_T = a\left(\frac{o_1 + o_n}{2} + o_2 + o_3 + ... + o_{n-1}\right)$ where $a =$ equal parts, $o_i = i^{th}$ ordinate

and $n =$ number of ordinate

$A_T = a(m_1 + m_2 + m_3 + ... + m_n)$ where $a =$ equal parts, $m_1 = \frac{o_1 + o_2}{2}$, $o_i = i^{th}$ ordinate

and $n =$ number of ordinate

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