



KWAZULU-NATAL PROVINCE

EDUCATION
REPUBLIC OF SOUTH AFRICA

**NATIONAL
SENIOR CERTIFICATE**

GRADE 11

Stanmorephysics.com **MATHEMATICS P1**

COMMON TEST

JUNE 2025

Stanmorephysics.com

MARKS: 100

TIME: 2 hours

This question paper consists of 8 pages.

INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of 5 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, etc. 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 correct to TWO decimal places, unless stated otherwise.
8. Write neatly and legibly.

QUESTION 1

1.1 Solve for x :



1.1.1 $(x-3)(2x+5)=0$ (2)

1.1.2 $4(x-3)=-x^2$ (3)

1.1.3 $3x^2+2x-4=0$ (answer correct to TWO decimal places) (3)

1.1.4 $-x^2+3x>0$ (4)

1.1.5 $(x^2+2)(x^2+2)-x^2-8=0$ (5)

1.2 Solve simultaneously for x and y :

$y-1=2x$ and $3x^2-5xy-24=-4y^2$ (6)

1.3 Consider the equation $mx^2+nx+p=0$.Calculate the values of x if it is given that $m+n+p=0$. (4)**[27]**

QUESTION 2

2.1 Simplify the following expressions, **WITHOUT** using a calculator:

2.1.1 $\frac{6^{n+2} \cdot 12^n}{72^n}$ (3)

2.1.2 $\sqrt{(\sqrt{13} - \sqrt[3]{-27})(\sqrt{13} - \sqrt{9})}$ (4)

2.2 It is given that $15^x = m$. Determine $\frac{3 \cdot 5^{x+2} - 3 \cdot 5^x}{-18 \cdot 3^{-x}}$ in terms of m . (3)

2.3 Solve for x , **WITHOUT** using a calculator:

2.3.1 $\sqrt{\left(\frac{81}{x}\right)^{-2}} = \frac{1}{9}$ (4)

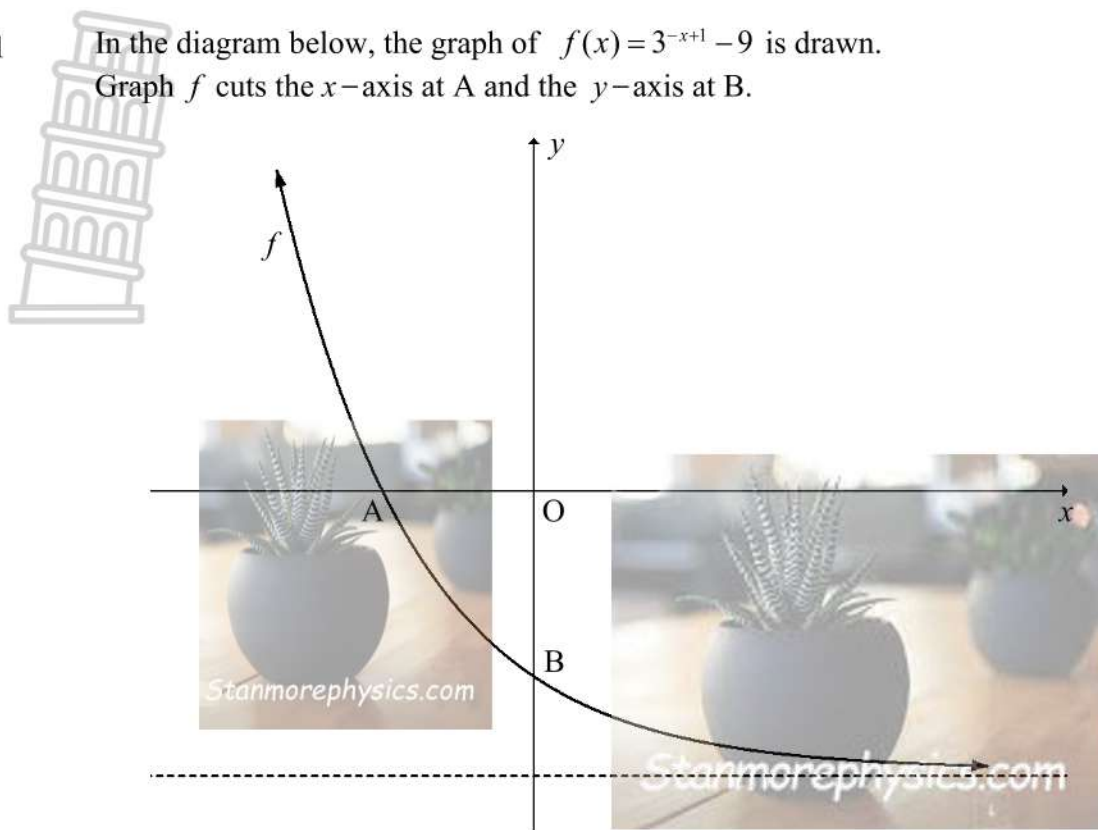
2.3.2 $\sqrt{x-2} = x-4$ (4)

2.3.3 $\frac{5^{x+1} - 5^x}{5^{2x+1} - 25^x} = 125$ (4)

[22]

QUESTION 3

- 3.1 In the diagram below, the graph of $f(x) = 3^{-x+1} - 9$ is drawn. Graph f cuts the x -axis at A and the y -axis at B.



- 3.1.1 Write down the equation of the asymptote of f . (1)
- 3.1.2 Calculate the coordinates of point A. (3)
- 3.1.3 Calculate the coordinates of point B. (2)
- 3.1.4 Write down the equation of p if $p(x) = f(x) + 6$ (1)
- 3.1.5 It is given that $f(x) = k$. Determine the values of k for which the root of the equation $f(x) = k$ is negative. (1)
- 3.1.6 Graph f is transformed to obtain $q(x) = \frac{1}{3^{x-3}} - 9$. Describe, in words, the transformation from f to q . (2)

- 3.2 The function of $g(x) = b^x + q$ has the following properties:
- $q > 0$
 - $b > 1$

Draw a neat sketch of g . Indicate clearly on your sketch the asymptote and the y -intercept. (3)

[13]

QUESTION 4

The straight lines $y = x + 4$ and $y = -x - 2$ are the axes of symmetry of the function

$$g(x) = \frac{a}{x+p} + q.$$

4.1 Determine the equations of asymptotes of g . (3)

4.2 It is given that g passes through $(-7; 2)$. Show that $g(x) = \frac{-4}{x+3} + 1$ (3)

4.3 Calculate the coordinates of the x -intercept of g . (3)

4.4 Calculate the coordinates of the y -intercept of g . (2)

4.5 Draw a neat sketch of g . Clearly show all intercepts with the axes and the asymptotes. (3)

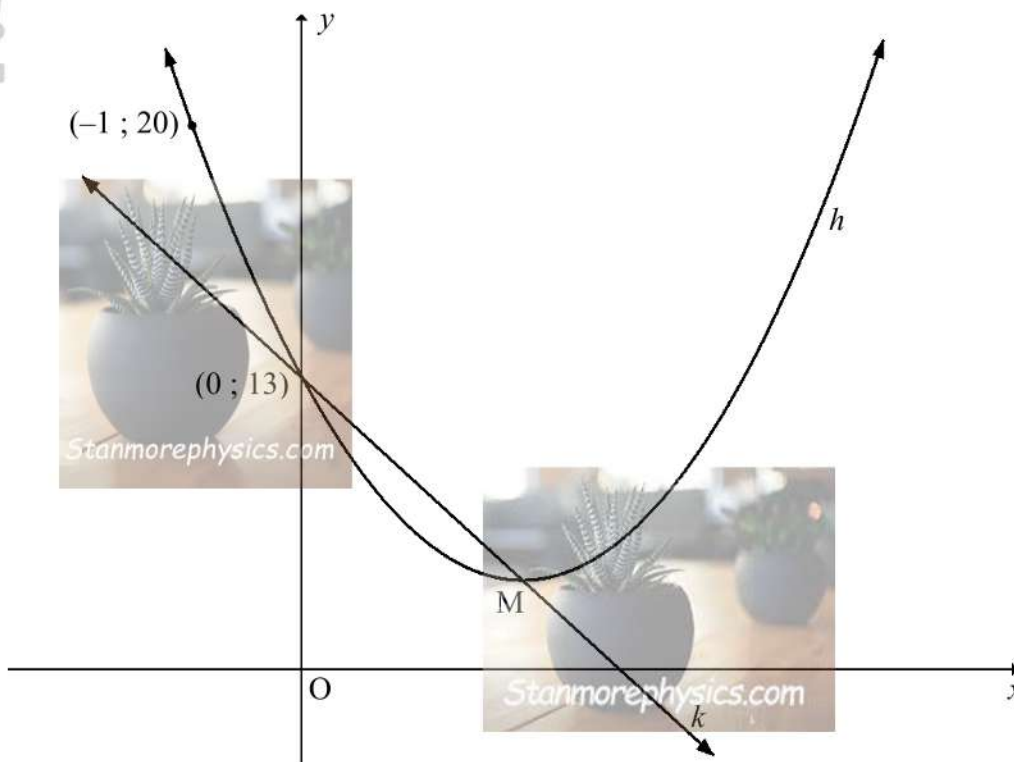
4.6 It is given that $m(x) = g(x-7) + 2$. Determine the domain of m . (2)

4.7 Determine the value(s) of x for which $m(x) \geq 0$. (2)

[18]

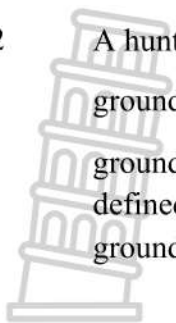
QUESTION 5

5.1 In the diagram below, the graphs of $h(x) = (x - 3)^2 + q$ and straight line k are drawn. Graph h has a turning point at M and passes through $(-1 ; 20)$. Graphs h and k intersect at $(0 ; 13)$ and M .



- 5.1.1 Calculate the value of q . (2)
- 5.1.2 Write down the range of h . (1)
- 5.1.3 Write down the equation of the axis of symmetry of h . (1)
- 5.1.4 Calculate the equation of straight line k in the form $y = mx + c$. (3)
- 5.1.5 Determine the values of x for which:
 - (a) $h(x) < k(x)$ (2)
 - (b) $h(x) \cdot k(x) \geq 0$ (2)
- 5.1.6 Determine the values of t for which the graph of $g(x) = -2x + t$ does not intersect h . (4)

- 5.2 A hunter, armed with a bow and an arrow, is standing on a cliff that is 6 metres above ground level. He spots an eagle flying horizontally at a height of $14\frac{1}{2}$ metres above ground level. He then shoots the arrow at the eagle. The flight path of the arrow is defined as $h(t) = -5t^2 + 13t + 6$, where h represents the distance, in metres, above ground level and t represents time elapsed, in seconds, after the arrow is shot.



Will the arrow hit the eagle? Support your answer with necessary calculations.

(5)
[20]

TOTAL MARKS : 100



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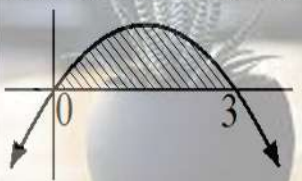
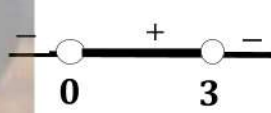
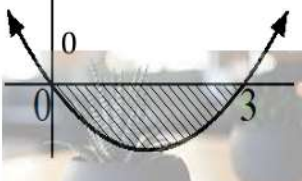
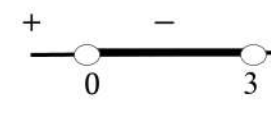
MARKING GUIDELINES

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MARKS: 100

These marking guidelines consist of 14 pages.

QUESTION 1


<p>1.1.1</p>	$(x-3)(2x+5) = 0$ $x = 3 \text{ or } x = -\frac{5}{2}$	<p>A✓ $x = 3$ A✓ $x = -\frac{5}{2}$</p> <p>(2)</p>
<p>1.1.2</p>	$4(x-3) = -x^2$ $4x - 12 = -x^2$ $x^2 + 4x - 12 = 0$ $(x+6)(x-2) = 0$ $x = -6 \text{ or } x = 2$	<p>A✓ standard form</p> <p>CA✓ correct factors</p> <p>CA✓ both answers</p> <p>(3)</p>
<p>1.1.3</p>	$3x^2 + 2x - 4 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(2) \pm \sqrt{(2)^2 - 4(3)(-4)}}{2(3)}$ $x = -1,54 \text{ or } x = 0,87$ <div style="border: 1px solid black; padding: 5px; width: fit-content; margin: 10px auto;"> <p>Penalise ONE mark for incorrect rounding</p> </div>	<p>A✓ correct substitution</p> <p>CA✓ answer CA✓ answer</p> <p>(3)</p>
<p>1.1.4</p>	<div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> $-x^2 + 3x > 0$ $-x(x-3) > 0$ <p>CV: $x = 0$ or $x = 3$</p>  <p>$0 < x < 3$</p> <p>OR</p> <p>$x \in (0; 3)$</p> </div> <div style="width: 45%; text-align: center;">  </div> </div> <p style="text-align: center; font-weight: bold; margin: 20px 0;">OR</p> <div style="display: flex; justify-content: space-between;"> <div style="width: 45%;"> $-x^2 + 3x > 0$ $x^2 - 3x < 0$ $x(x-3) < 0$ <p>CV: $x = 0$ or $x = 3$</p>  <p>$0 < x < 3$</p> <p>OR</p> <p>$x \in (0; 3)$</p> </div> <div style="width: 45%; text-align: center;">  </div> </div>	<p>A✓ correct factors</p> <p>CA✓ critical values (accept critical values if shown on a sketch or number line)</p> <p>CA✓✓ answer</p> <p>(4)</p> <p style="text-align: center; font-weight: bold; margin: 20px 0;">OR</p> <p>A✓ correct factors</p> <p>CA✓ critical values (accept critical values if shown on a sketch or number line)</p> <p>CA✓✓ answer</p> <p>(4)</p>


<p>1.1.5</p>	$(x^2 + 2)(x^2 + 2) - x^2 - 8 = 0$ $x^4 + 4x^2 + 4 - x^2 - 8 = 0$ $x^4 + 3x^2 - 4 = 0$ $(x^2 + 4)(x^2 - 1) = 0$ $x^2 = -4 \text{ or } x^2 = 1$ <p>no solution or $x = \pm 1$</p> <p style="text-align: center;">OR</p> $(x^2 + 2)(x^2 + 2) - x^2 - 8 = 0$ $(x^2 + 2)(x^2 + 2) - x^2 - 2 - 6 = 0$ $(x^2 + 2)(x^2 + 2) - (x^2 + 2) - 6 = 0$ $(x^2 + 2)^2 - (x^2 + 2) - 6 = 0$ $[(x^2 + 2) - 3][(x^2 + 2) + 2] = 0$ $(x^2 - 1)(x^2 + 4) = 0$ $x^2 = 1 \text{ or } x^2 = -4$ $x = \pm 1 \text{ or no solution}$	<p>A✓ multiplying: remove brackets CA✓ standard form CA✓ factors</p> <p>CA✓ rejecting $x^2 = -4$ CA✓ both values of x (5)</p> <p style="text-align: center;">OR</p> <p>A✓ splitting -8</p> <p>CA✓ standard form CA✓ factors</p> <p>CA✓ both values of x CA✓ rejecting $x^2 = -4$ (5)</p>
<p>1.2</p>	$y = 1 + 2x$ $3x^2 - 5xy - 24 = -4y^2$ $3x^2 - 5x(1 + 2x) - 24 = -4(1 + 2x)^2$ $3x^2 - 5x - 10x^2 - 24 = -4(1 + 4x + 4x^2)$ $-7x^2 - 5x - 24 = -4 - 16x - 16x^2$ $9x^2 + 11x - 20 = 0$ $(9x + 20)(x - 1) = 0$ $x = -\frac{20}{9} \text{ or } x = 1$ $y = 1 + 2\left(-\frac{20}{9}\right) \text{ or } y = 1 + 2(1)$ $y = -\frac{31}{9} \text{ or } y = 3$ <p style="text-align: center;">OR</p>	<p>A✓ rewriting equation as $y = \dots$</p> <p>CA✓ substituting $y = 1 + 2x$ into quadratic equation</p> <p>CA✓ standard form CA✓ factors</p> <p>CA✓ both values of x</p> <p>CA✓ both values of y (6)</p> <p style="text-align: center;">OR</p>

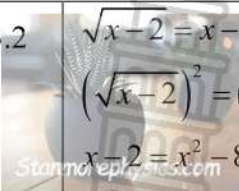

	$y = 1 + 2x$ $x = \frac{y-1}{2}$ $3x^2 - 5xy - 24 = -4y^2$ $3\left(\frac{y-1}{2}\right)^2 - 5\left(\frac{y-1}{2}\right)y - 24 = -4y^2$ $3\left(\frac{y^2 - 2y + 1}{4}\right) - 5y\left(\frac{y-1}{2}\right) - 24 = -4y^2$ $\frac{3}{4}(y^2 - 2y + 1) - \frac{5}{2}y(y-1) = 24 - 4y^2$ $3y^2 - 6y + 3 - 10y^2 + 10y - 96 + 16y^2 = 0$ $9y^2 + 4y - 93 = 0$ $(9y + 31)(y - 3) = 0$ $y = -\frac{31}{9} \quad \text{or} \quad y = 3$ $x = \frac{\left(-\frac{31}{9}\right) - 1}{2} \quad \text{or} \quad x = \frac{(3) - 1}{2}$ $x = -\frac{20}{9} \quad \text{or} \quad x = 1$	<p>A✓ rewriting equation as $x = \dots$</p> <p>CA✓ substituting $x = \frac{y-1}{2}$ into quadratic equation</p> <p>CA✓ standard form</p> <p>CA✓ factors</p> <p>CA✓ both values of y</p> <p>CA✓ both values of x</p> <p style="text-align: right;">(6)</p>
<p>1.3</p>	$m + n + p = 0$ $p = -m - n$ $mx^2 + nx + p = 0$ $mx^2 + nx - m - n = 0$ $x = \frac{-n \pm \sqrt{n^2 - 4(m)(-m-n)}}{2m}$ $= \frac{-n \pm \sqrt{n^2 + 4mn + 4m^2}}{2m}$ $= \frac{-n \pm \sqrt{(n+2m)^2}}{2m}$ $x = \frac{-n + (n+2m)}{2m} \quad \text{or} \quad x = \frac{-n - (n+2m)}{2m}$ $x = \frac{2m}{2m} \quad \quad \quad x = \frac{-2n - 2m}{2m}$ $x = 1 \quad \quad \quad x = \frac{-n - m}{m} = \frac{p}{m}$ <p>OR</p>	<p>✓A rewriting $p =$</p> <p>✓A substitution into quadratic formula</p> <p>✓A simplification</p> <p>✓A both answers</p> <p style="text-align: right;">(4)</p>

$m + n + p = 0$ $n = -m - p$ $mx^2 + nx + p = 0$ $mx^2 + (-m - p)x + p = 0$ $x = \frac{-(-m - p) \pm \sqrt{(-m - p)^2 - 4(m)(p)}}{2m}$ $= \frac{(m + p) \pm \sqrt{m^2 - 2mp + p^2}}{2m}$ $= \frac{(m + p) \pm \sqrt{(m - p)^2}}{2m}$ $x = \frac{(m + p) + (m - p)}{2m} \quad \text{or} \quad x = \frac{(m + p) - (m - p)}{2m}$ $x = \frac{2m}{2m} \quad \text{or} \quad x = \frac{2p}{2m}$ $x = 1 \quad \text{or} \quad x = \frac{p}{m}$	<p>✓ A rewriting $n =$</p> <p>✓ A substitution into quadratic formula</p> <p>✓ A simplification</p> <p>✓ A both answers</p> <p style="text-align: right;">(4)</p>
<p>OR</p> $m + n + p = 0$ $m = -n - p$ $mx^2 + nx + p = 0$ $(-n - p)x^2 + nx + p = 0$ $x = \frac{-(n) \pm \sqrt{(n)^2 - 4(-n - p)(p)}}{2(-n - p)}$ $= \frac{-n \pm \sqrt{n^2 + 4np + 4p^2}}{2(-n - p)}$ $= \frac{-n \pm \sqrt{(n + 2p)^2}}{2(-n - p)}$ $x = \frac{-n + (n + 2p)}{2(-n - p)} \quad \text{or} \quad x = \frac{-n - (n + 2p)}{2(-n - p)}$ $x = \frac{2p}{2m} \quad \text{or} \quad x = \frac{-2n - 2p}{-2n - 2p}$ $x = \frac{p}{m} \quad \text{or} \quad x = 1$	<p>✓ A rewriting $m =$</p> <p>✓ A substitution into quadratic formula</p> <p>✓ A simplification</p> <p>✓ A both answers</p> <p style="text-align: right;">(4)</p>

QUESTION 2

<p>2.1.1</p>	$\frac{6^{n+2} \cdot 12^n}{72^n}$ $= \frac{(3 \cdot 2)^{n+2} \cdot (2^2 \cdot 3)^n}{(2^3 \cdot 3^2)^n}$ $= \frac{3^{n+2} \cdot 2^{n+2} \cdot 2^{2n} \cdot 3^n}{2^{3n} \cdot 3^{2n}}$ $= 3^{n+2+n-2n} \cdot 2^{n+2+2n-3n}$ $= 3^2 \cdot 2^2$ $= 9 \cdot 4$ $= 36$  <p style="text-align: center;">OR</p> $\frac{6^{n+2} \cdot 12^n}{72^n}$ $= \frac{6^{n+2} \cdot 12^n}{(6 \cdot 12)^n}$ $= \frac{6^{n+2} \cdot 12^n}{6^n \cdot 12^n}$ $= 6^{n+2-n}$ $= 6^2$ $= 36$	<p>A✓ rewriting with prime bases</p> <p>CA✓ simplifying using exponent laws</p> <p>CA✓ answer (3)</p> <p style="text-align: center;">OR</p> <p>A✓ rewriting with the same bases</p> <p>CA✓ simplifying using exponent laws</p> <p>CA✓ answer (3)</p>
<p>2.1.2</p>	$\sqrt{(\sqrt{13} - \sqrt[3]{-27})(\sqrt{13} - \sqrt{9})}$ $= \sqrt{(\sqrt{13} - (-3))(\sqrt{13} - 3)}$ $= \sqrt{(\sqrt{13} + 3)(\sqrt{13} - 3)}$ $= \sqrt{13 - 9}$ $= \sqrt{4}$ $= 2$	<p>A✓ (-3) A✓ 3</p> <p>CA✓ $\sqrt{4}$</p> <p>CA✓ answer (4)</p>

<p>2.2</p>	$\frac{3.5^{x+2} - 3.5^x}{-18.3^{-x}}$ $= \frac{3.5^x \cdot 5^2 - 3.5^x}{-18.3^{-x}}$ $= \frac{5^x (3.5^2 - 3)}{-18.3^{-x}} \quad \text{OR} \quad = \frac{3.5^x (5^2 - 1)}{-18.3^{-x}}$ $= \frac{5^x (72)}{-18.3^{-x}} \quad \text{OR} \quad = \frac{3^x \cdot 5^x (24)}{-6}$ $= \frac{5^x (-4)}{3^{-x}}$ $= -4.5^x 3^x$ $= -4 \cdot (5.3)^x$ $= -4.15^x$ $= -4m$ 	<p>A✓ common factor of $5^x (3.5^2 - 3)$ OR $3.5^x (5^2 - 1)$</p> <p>A✓ $-4.5^x 3^x$</p> <p>A✓ answer</p> <p>(3)</p>
<p>2.3.1</p>	$\sqrt[3]{\left(\frac{81}{x}\right)^{-2}} = \frac{1}{9}$ $\left(\frac{81}{x}\right)^{\frac{2}{3}} = 3^{-2}$ $\left(\frac{81}{x}\right)^{\frac{2}{3} \times \left(\frac{3}{2}\right)} = 3^{-2 \times \left(\frac{3}{2}\right)}$ $\frac{81}{x} = 3^3$ $x = \frac{3^4}{3^3}$ $x = 3$ <p style="text-align: center;">OR</p> $\sqrt[3]{\left(\frac{81}{x}\right)^{-2}} = \frac{1}{9}$ $\left(\frac{81}{x}\right)^{\frac{2}{3}} = 3^{-2}$ $\left(\frac{81}{x}\right)^{\frac{2}{3}} = (3^3)^{\frac{2}{3}}$ $\frac{81}{x} = 27$ $27x = 81$ $x = 3$	<p>A✓ $\left(\frac{81}{x}\right)^{\frac{2}{3}}$ A✓ 3^{-2}</p> <p>CA✓ × reciprocal on exponents</p> <p>CA✓ answer</p> <p style="text-align: center;">OR</p> <p>A✓ $\left(\frac{81}{x}\right)^{\frac{2}{3}}$ A✓ $(3^3)^{\frac{2}{3}}$</p> <p>CA✓ equating bases</p> <p>CA✓ answer</p> <p>(4)</p>

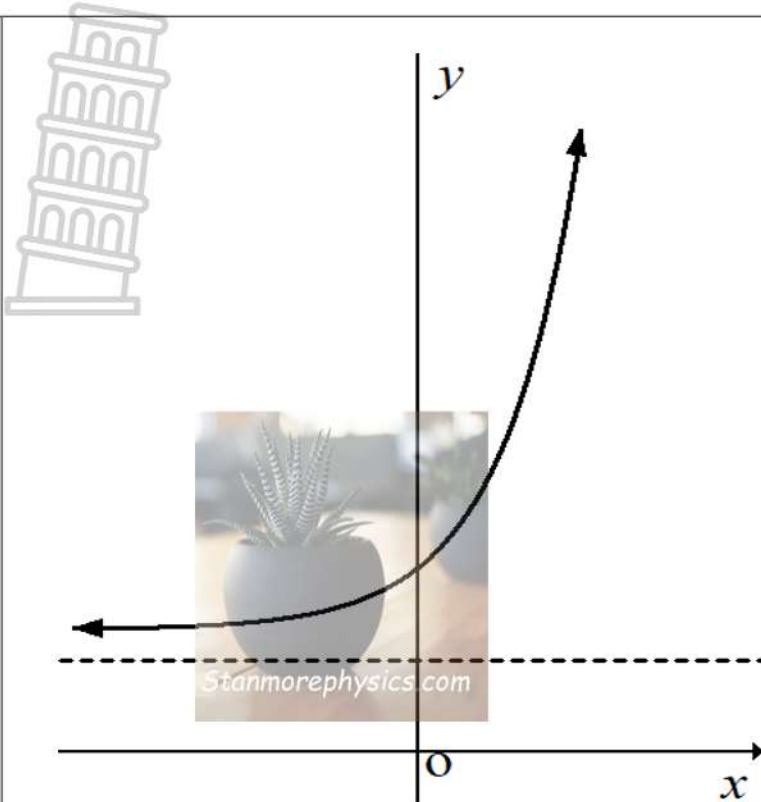
<p>2.3.2</p>	 $\sqrt{x-2} = x-4$ $(\sqrt{x-2})^2 = (x-4)^2$ $x-2 = x^2 - 8x + 16$ $x^2 - 8x - x + 16 + 2 = 0$ $x^2 - 9x + 18 = 0$ $(x-6)(x-3) = 0$ $x = 6 \text{ or } x = 3$	<p>A✓ squaring both sides</p> <p>CA✓ standard form</p> <p>CA✓ factors</p> <p>CA✓ answers with rejection</p> <p>(4)</p>
<p>2.3.3</p>	 $\frac{5^{x+1} - 5^x}{5^{2x+1} - 25^x} = 125$ $\frac{5^x \cdot 5 - 5^x}{5^{2x} \cdot 5 - 5^{2x}} = 5^3$ $\frac{5^x(5^1 - 1)}{5^{2x}(5^1 - 1)} = 5^3$ $5^{-x} = 5^3$ $-x = 3$ $x = -3$	<p>A✓ rewriting with base 5</p> <p>CA✓ common factor in both numerator and denominator</p> <p>CA✓ $5^{-x} = 5^3$</p> <p>CA✓ answer</p> <p>(4)</p>

[22]

QUESTION 3

3.1.1	$y = -9$	A✓ answer (1)
3.1.2	$f(x) = 3^{-x+1} - 9$ $0 = 3^{-x+1} - 9$ $9 = 3^{-x+1}$ $3^2 = 3^{-x+1}$ $2 = -x + 1$ $x = -1$ A(-1; 0)	A✓ $f(x) = 0$ OR subst $y = 0$ CA✓ $3^2 = 3^{-x+1}$ CA✓ value of x (3)
3.1.3	$f(0) = 3^{-0+1} - 9$ $= -6$ B(0; -6)	A✓ $f(0)$ OR subst $x = 0$ CA✓ value of y (2)
3.1.4	$p(x) = (3^{-x+1} - 9) + 6$ $p(x) = 3^{-x+1} - 3$	A✓ answer (1)
3.1.5	$k > -6$ OR $k \in (-6; \infty)$	A✓ answer (1) OR A✓ answer (1)
3.1.6	$f(x) = 3^{-x+1} - 9$ $q(x) = 3^{-x+3} - 9$ $= 3^{-(x-2)+1} - 9$ ∴ translation of 2 units to the right OR $f(x) = \frac{1}{3^{x-1}} - 9$ $q(x) = \frac{1}{3^{x-3}} - 9$ $= \frac{1}{3^{(x-2)-1}} - 9$ ∴ translation of 2 units to the right	A✓ simplified equation of q CA✓ answer (2) OR A✓ simplified equation of f CA✓ answer (2)

3.2



A✓ positive y -asymptote

A✓ positive y -intercept

A✓ g is increasing above the asymptote

(3)

[13]

QUESTION 4

4.1	$x + 4 = -x - 2$ $\frac{2x}{2} = \frac{-6}{2}$ $x = -3$ $y = 1$	A✓ equating both equations CA✓ equation of vertical asymptote CA✓ equation of horizontal asymptote (3)
4.2	$g(x) = \frac{a}{x+p} + q$ $g(x) = \frac{a}{x+3} + 1$ $2 = \frac{a}{-7+3} + 1$ $1 = \frac{a}{-4}$ $a = -4$ $\therefore g(x) = \frac{-4}{x+3} + 1$	A✓ subst. values of p and q A✓ substituting $(-7; 2)$ A✓ value of a (3)
4.3	$g(x) = \frac{-4}{x+3} + 1$ $0 = \frac{-4}{x+3} + 1$ $-1 = \frac{-4}{x+3}$ $-(x+3) = -4$ $-x-3 = -4$ $-x = -1$ $x = 1$	A✓ substitution of $g(x) = 0$ CA✓ simplification CA✓ answer (3)
4.4	$g(0) = \frac{-4}{0+3} + 1$ $= -\frac{1}{3}$	A✓ substitution of $g(0)$ CA✓ answer (2)

<p>4.5</p>	<p>The graph shows a rational function with a vertical asymptote at $x = -3$ and a horizontal asymptote at $y = -1$. The curve passes through the points $(0; \frac{1}{3})$ and $(1; 0)$. The x-axis and y-axis are shown, with the origin marked as 1. The function approaches the horizontal asymptote as $x \rightarrow \pm\infty$ and the vertical asymptote as $x \rightarrow -3$.</p>	<p>A✓ asymptotes CA✓ intercepts with axes CA✓ shape</p> <p>(3)</p>
<p>4.6</p>	<p>$x \in \mathbb{R}; x \neq 4$</p> <p style="text-align: center;">OR</p> <p>$x \in (-\infty; 4) \cup (4; \infty)$</p> <p style="text-align: center;">OR</p> <p>$x < 4$ or $x > 4$</p>	<p>A✓✓ answer (2)</p> <p style="text-align: center;">OR</p> <p>A✓✓ answer (2)</p> <p style="text-align: center;">OR</p> <p>A✓✓ answer (2)</p>
<p>4.7</p>	<p>$m(x) = \frac{-4}{x+3-7} + 1 + 2$</p> <p>x-intercept of m: $0 = \frac{-4}{x-4} + 3$</p> <p>$\frac{4}{x-4} = 3$</p> <p>$x-4 = \frac{4}{3}$</p> <p>$x = \frac{16}{3}$</p> <p>Domain of m: $x < 4$ or $x \geq \frac{16}{3}$</p> <p style="text-align: center;">OR</p> <p>Domain of m: $x \in (-\infty; 4) \cup \left[\frac{16}{3}; \infty\right)$</p>	<p>CA✓✓ answer (2)</p> <p style="text-align: center;">OR</p> <p>CA✓✓ answer (2)</p>

QUESTION 5

<p>5.1.1</p>	$h(x) = (x - 3)^2 + q$ $13 = (0 - 3)^2 + q$ $13 = 9 + q$ $q = 4$ <p style="text-align: center;">OR</p> $h(x) = (x - 3)^2 + q$ $20 = (-1 - 3)^2 + q$ $20 = 16 + q$ $q = 4$	<p>A✓ substitution of (0 ; 13)</p> <p>CA✓ answer (2)</p> <p style="text-align: center;">OR</p> <p>A✓ substitution of (-1 ; 20)</p> <p>CA✓ answer (2)</p>
<p>5.1.2</p>	$y \geq 4 ; y \in \mathbb{R}$ <p style="text-align: center;">OR</p> $y \in [4 ; \infty)$	<p>CA✓ answer (1)</p> <p style="text-align: center;">OR</p> <p>CA✓ answer (1)</p>
<p>5.1.3</p>	$x = 3$	<p>A✓ answer (1)</p>
<p>5.1.4</p>	$m = \frac{4 - 13}{3 - 0}$ $m = -3$ $\therefore y = -3x + 13$ <p style="text-align: center;">OR</p> $y = mx + 13$ $4 = m(3) + 13$ $-9 = 3m$ $m = -3$ $\therefore y = -3x + 13$	<p>A✓ substituting points into grad. formula</p> <p>CA✓ gradient of k</p> <p>CA✓ answer (3)</p> <p style="text-align: center;">OR</p> <p>A✓ substituting point</p> <p>CA✓ gradient of k</p> <p>CA✓ answer (3)</p>
<p>5.1.5(a)</p>	$0 < x < 3$ <p style="text-align: center;">OR</p> $x \in (0 ; 3)$	<p>A✓✓ answer (2)</p> <p style="text-align: center;">OR</p> <p>A✓✓ answer (2)</p>
<p>5.1.5(b)</p>	$y = -3x + 13$ $0 = -3x + 13$ $x = \frac{13}{3}$ $\therefore x \leq \frac{13}{3} \quad \text{OR} \quad x \in \left(-\infty ; \frac{13}{3}\right]$	<p>CA ✓ x-intercept of k</p> <p>CA✓ answer (2)</p>

5.1.6	$x^2 - 6x + 13 = -2x + t$ $x^2 - 4x + 13 - t = 0$ $(-4)^2 - 4(1)(13 - t) < 0$ $16 - 52 + 4t < 0$ $4t < 36$ $t < 9$	A✓ equating ✓CA calculating Δ ✓A $\Delta < 0$ ✓CA answer (4)
5.2	$h(t) = -5t^2 + 13t + 6$ $t = \frac{-13}{2(-5)}$ $t = \frac{13}{10}$ $h\left(\frac{13}{10}\right) = -5\left(\frac{13}{10}\right)^2 + 13\left(\frac{13}{10}\right) + 6$ $h\left(\frac{13}{10}\right) = \frac{289}{20} \text{ or } 14\frac{9}{20} \text{ or } 14,45 \text{ m}$ <p>NO. The maximum height that the arrow reaches is below the height at which the eagle is flying</p> <p style="text-align: center;">OR</p> $h(t) = 14\frac{1}{2} \text{ m}$ $-5t^2 + 13t + 6 = 14\frac{1}{2}$ $-5t^2 + 13t - \frac{17}{2} = 0$ $\Delta = b^2 - 4ac$ $\Delta = (13)^2 - 4(-5)\left(-\frac{17}{2}\right)$ $\Delta = -1$ <p>NO he won't be able to hit the eagle because the eagle's path does NOT meet the arrow's path</p> <p style="text-align: center;">OR</p> $-5t^2 + 13t + 6 = 14\frac{1}{2}$ $5t^2 - 13t + \frac{17}{2} = 0$ $t = \frac{-(-13) \pm \sqrt{(-13)^2 - 4(5)\left(+\frac{17}{2}\right)}}{2(5)}$ <p>no solution for t</p> <p>NO, he won't be able to hit the eagle because the eagle's path does NOT intersect the path of the arrow</p>	A✓ subst. into the axis of symmetry CA✓ substituting into the original equation CA✓ maximum height CA✓ NO CA✓ reason (5) <p style="text-align: center;">OR</p> A✓ equating h to $14\frac{1}{2}$ CA✓ standard form CA✓ value of Δ CA✓ NO CA✓ reason (5) <p style="text-align: center;">OR</p> A✓ equating h to $14\frac{1}{2}$ CA✓ standard form CA✓ solution of equation CA✓ NO CA✓ reason (5)

[20]

TOTAL MARK : 100