



GAUTENG PROVINCE
EDUCATION
REPUBLIC OF SOUTH AFRICA

JOHANNESBURG WEST DISTRICT

**TERM 1
CONTROLLED TEST
01 MARCH 2023**

GRADE 11

MATHEMATICS

MARKS: 50

DURATION: 1 HOUR

This question paper consists of 5 pages including this cover sheet.

INSTRUCTIONS AND INFORMATION

1. This question paper consists of 3 questions.
2. Answer ALL the questions in your answer book.
3. Use the appropriate and correct numbering system as it is used on this 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. 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. It is in your own interest to write legibly and to present your work neatly.



QUESTION 1

Solve for x

1.1 $x(5x + 2) = 0$ (2)

1.2 $x(2x - 3) = 4$ (correct to TWO decimal places) (4)

1.3 $x^2 - x - 6 \geq 6$ (4)

1.4 $2^{x+2} + 2^{x-2} + 2^x = 42$ (4)

1.5 $\sqrt{4x - 11} = 2 - x$ (5)

[19]

QUESTION 2

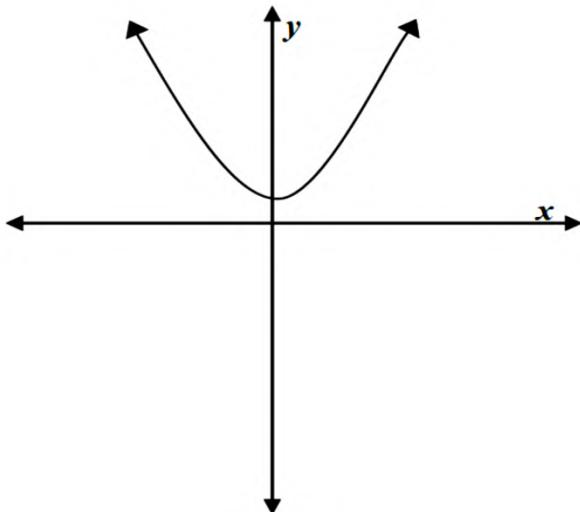
2.1 Simplify, without using a calculator $\left(\frac{\sqrt{7^{2011}} - \sqrt{7^{2009}}}{\sqrt{7^{2008}}} + \sqrt{7} \right)^2$ (4)

2.2 Solve for x and y simultaneously if:

$$2x - y = 3 \text{ and } x^2 + 5xy + y^2 = 15 \quad (6)$$

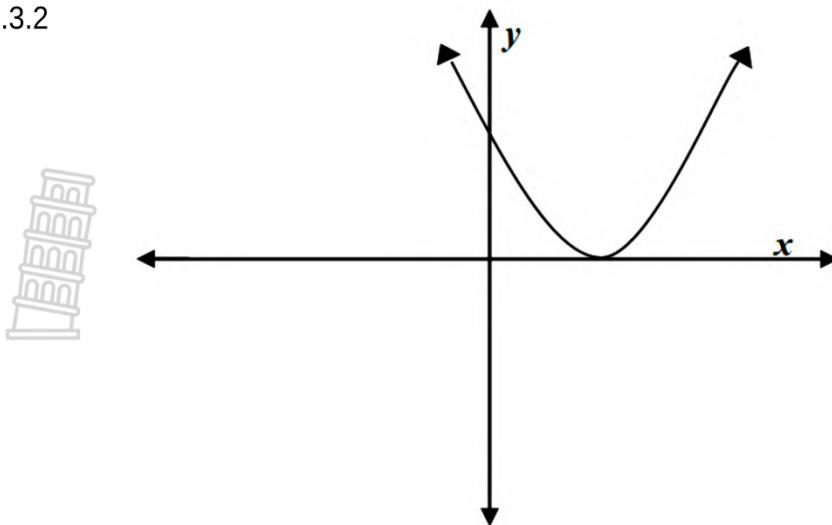
2.3 Discuss the nature of the roots of the following graphs

2.3.1



(2)

2.3.2



2.4 The solution of a quadratic equation is given by:

$$x = \frac{-2 \pm \sqrt{13 - 2k}}{3}$$

Determine the value of k for which these x -values will be rational.

(3)

[17]

QUESTION 3

- 3.1 If $\tan \theta = -\frac{2}{3}$ and $\sin \theta > 0$, calculate by using a sketch, the value of

$$\cos \theta \cdot \sin \theta \quad (4)$$

- 3.2 Simplify the following expression to a single trigonometric ratio:

$$\frac{\sin(360^\circ - x) \cdot \tan(-x)}{\cos(180^\circ + x) \cdot (\sin^2 A + \cos^2 A)} \quad (6)$$

- 3.3 Prove the identity:

$$\tan \theta - \frac{\cos \theta}{\sin \theta} = \frac{1 - 2 \cos^2 \theta}{\sin \theta \cdot \cos \theta} \quad (4)$$

[14]

TOTAL = 50 MARKS



JOHANNESBURG WEST DISTRICT

MARKING MEMORANDUM

CONTROLLED TEST 1

01 MARCH 2023

GRADE 11

MATHEMATICS

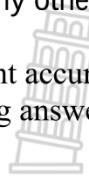
MARKS: 50

This Marking Guidelines consists of 6 pages including this cover page.

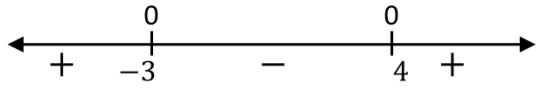


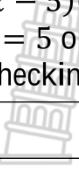
IMPORTANT NOTES AND INFORMATION

- If a candidate answers a question TWICE, only mark the FIRST attempt.
- If a candidate has crossed out an attempt of a question and not redone the question, mark the crossed out version.
- Accept any other Mathematically valid attempt which yields a correct answer and credit full marks.
- Consistent accuracy applies in ALL aspects of the marking memorandum.
- Assuming answers/values in order to solve a problem is NOT acceptable.



QUESTION 1

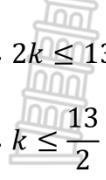
1.1	$x(5x + 2) = 0$ $x = 0 \text{ or } x = -\frac{2}{5}$	✓✓ Each root (2)
1.2	$2x^2 - 3x - 4 = 0$ $x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $x = \frac{-(-3) \pm \sqrt{(-3)^2 - 4(2)(-4)}}{2(2)}$ $= \frac{3 \pm \sqrt{41}}{4}$ $x = -0,85 \text{ or } x = 2,35$	✓ Standard form ✓ Substitution into quadratic formula ✓✓ Each root $x = -0,85 \text{ or } x = 2,35$ (-1, if incorrect rounding) (4)
1.3	$x^2 - x - 6 \geq 0$ $x^2 - x - 12 \geq 0$ $(x + 3)(x - 4) \geq 0$  $x \leq -3 \text{ or } x \geq 4$	✓ Standardd form ✓ Factors ✓ Both critical values ✓ notation (4)
1.4	$2^{x+2} + 2^{x-2} + 2^x = 42$ $2^2 2^x + \frac{2^x}{2^2} + 2^x = 42$ $2^x \left(2^2 + \frac{1}{2^2} + 1 \right) = 42$ $2^x = \frac{42 \cdot 4}{21}$ $2^x = 2^3$ $x = 3$	✓ Common factor ✓ Simplification ✓ Same base ✓ Answer (4)

1.5	$\sqrt{4x - 11} = 2 - x$ $4x - 11 = 4 - 4x + x^2$ $x^2 - 8x + 15 = 0$ $(x - 5)(x - 3) = 0$ $x = 5 \text{ or } x = 3$ <p>Checking shows No Solution</p>	✓ Squaring both sides ✓ Standard form ✓ Factors ✓ Each root ✓ No solution	(5)
			[19]

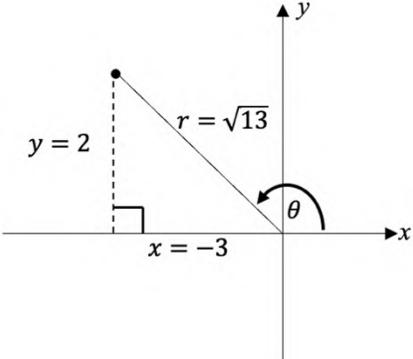
QUESTION 2

2.1	$\left(\frac{\sqrt{7^{2011}} - \sqrt{7^{2009}}}{\sqrt{7^{2008}}} + \sqrt{7} \right)^2$ $= \left(\frac{\sqrt{7^{2008}}(\sqrt{7^3} - \sqrt{7^1})}{\sqrt{7^{2008}}} + \sqrt{7} \right)^2$ $= (\sqrt{7^3} - \sqrt{7^1} + \sqrt{7})^2$ $= (7\sqrt{7} - \sqrt{7} + \sqrt{7})^2$ $= (7\sqrt{7})^2$ $= 343$ <p>OR</p> $\left(\frac{\sqrt{7^{2011}} - \sqrt{7^{2009}}}{\sqrt{7^{2008}}} + \sqrt{7} \right)^2$ $= \left(\frac{7^{\frac{2011}{2}} - 7^{\frac{2009}{2}}}{7^{\frac{2008}{2}}} + 7^{\frac{1}{2}} \right)^2$ $= \left(\frac{7^{\frac{2009}{2}}(7-1)}{7^{1004}} + 7^{\frac{1}{2}} \right)^2$ $= \left(7 \cdot 7^{\frac{1}{2}} \right)^2$ $= 343$	✓ $\sqrt{7^{2008}}$ ✓ $\sqrt{7^3} - \sqrt{7^1}$ ✓ $(7\sqrt{7})^2$ ✓ Answer	(4)
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<p>2.2</p> <p>From (1) : $y = 2x - 3$</p> <p>Subst (1) into (2)</p> $x^2 + 5x(2x - 3) + (2x - 3)^2 = 15$ $x^2 + 10x^2 - 15x + 4x^2 - 12x + 9 - 15 = 0$ $15x^2 - 27x - 6 = 0$ $(5x + 1)(3x - 6) = 0$ $x = \frac{-1}{5} \quad \text{or} \quad x = 2$ $y = \frac{-17}{5} \quad \text{or} \quad y = 1$ <p>OR</p> $2x - y = 3 \rightarrow (1)$ $x^2 + 5xy + y^2 = 15 \rightarrow (2)$ $\text{From (1)} : x = \frac{y+3}{2}$ <p>Subst (1) into (2)</p> $\left(\frac{y+3}{2}\right)^2 + 5y\left(\frac{y+3}{2}\right) + y^2 = 15$ $\left(\frac{y^2 + 6y + 9}{4}\right) + \frac{5y^2 + 15y}{2} + y^2 = 15$ $y^2 + 6y + 9 + 10y^2 + 30y + 4y^2 = 60$ $15y^2 + 36y - 51 = 0$ $5y^2 + 12y - 17 = 0$ $(5y + 17)(y - 1) = 0$ $y = \frac{-17}{5} \quad \text{or} \quad y = 1$ $x = \frac{-1}{5} \quad \text{or} \quad x = 2$	<p>✓ y as subject</p> <p>CA ✓ Substitution $y = 2x - 3$</p> <p>CA ✓ Std. form</p> <p>CA ✓ factors</p> <p>CA ✓ x values</p> <p>CA ✓ y values</p> <p>✓ x as subject</p> <p>CA ✓ substitution $x = \frac{y+3}{2}$ (6)</p> <p>CA ✓ Std. form</p> <p>CA ✓ factors</p> <p>CA ✓ y values</p> <p>CA ✓ y values (6)</p>
<p>2.3.1</p> <p>Roots are non-real (imaginary), $\Delta < 0$</p>	<p>✓✓ Roots are non-real OR imaginary (2)</p>
<p>2.3.2</p> <p>Roots are real and equal, $\Delta = 0$</p>	<p>✓ Roots are real ✓ Roots are equal (2)</p>

2.4 $x = \frac{-2 \pm \sqrt{13 - 2k}}{3}$ $\therefore \Delta = 13 - 2k \geq 0$ $\therefore 2k \leq 13$ $\therefore k \leq \frac{13}{2}$	 $\checkmark \Delta \geq 0$ \checkmark simplifying $\checkmark k \leq \frac{13}{2}$	(3)
		[17]

QUESTION 3

3.1 $\tan \theta = -\frac{2}{3} = \frac{y}{x}$		\checkmark correct sketch in the correct quadrant	(4)
$r^2 = x^2 + y^2$ [Pythagoras] $r^2 = (3)^2 + (-2)^2$ $\therefore r = \sqrt{13}$ units $\cos \theta \cdot \sin \theta = \left(-\frac{3}{\sqrt{13}}\right) \cdot \left(\frac{2}{\sqrt{13}}\right)$ $= -\frac{6}{13}$	$\checkmark r = \sqrt{13}$ \checkmark substitution \checkmark answer		

<p>3.2</p> $\begin{aligned} & \frac{\sin(360^\circ-x) \cdot \tan(-x)}{\cos(180^\circ+x) \cdot (\sin^2 A + \cos^2 A)} \\ &= \frac{-\sin x \cdot (-\tan x)}{-\cos x \cdot 1} \\ &= \frac{-\sin x \cdot \left(-\frac{\sin x}{\cos x}\right)}{-\cos x \cdot 1} \\ &= -\sin x \end{aligned}$	<p><input checked="" type="checkbox"/> $-\sin x$ <input checked="" type="checkbox"/> $-\cos x$ <input checked="" type="checkbox"/> $-\tan x$ <input checked="" type="checkbox"/> $-\frac{\sin x}{\cos x}$ <input checked="" type="checkbox"/> 1 <input checked="" type="checkbox"/> answer</p>	<p>(6)</p>
<p>3.3</p> $\begin{aligned} \text{LHS} &= \tan \theta - \frac{\cos \theta}{\sin \theta} \\ &= \frac{\sin \theta}{\cos \theta} - \frac{\cos \theta}{\sin \theta} \\ &= \frac{\sin^2 \theta - \cos^2 \theta}{\sin \theta \cdot \cos \theta} \\ &= \frac{1 - \cos^2 \theta - \cos^2 \theta}{\sin \theta \cdot \cos \theta} \\ &= \frac{1 - 2\cos^2 \theta}{\sin \theta \cdot \cos \theta} \\ \therefore \text{LHS} &= \text{RHS} \end{aligned}$	<p><input checked="" type="checkbox"/> $\frac{\sin \theta}{\cos \theta}$ <input checked="" type="checkbox"/> $\sin^2 \theta - \cos^2 \theta$ <input checked="" type="checkbox"/> LCD: $\sin \theta \cdot \cos \theta$ <input checked="" type="checkbox"/> $1 - \cos^2 \theta$</p>	
<p>OR</p> $\begin{aligned} \text{LHS} &= \frac{1 - 2\cos^2 \theta}{\sin \theta \cdot \cos \theta} \\ &= \frac{\sin^2 \theta + \cos^2 \theta - 2\cos^2 \theta}{\sin \theta \cdot \cos \theta} \\ &= \frac{\sin^2 \theta - \cos^2 \theta}{\sin \theta \cdot \cos \theta} \\ &= \frac{\sin \theta}{\cos \theta} - \frac{\cos \theta}{\sin \theta} \\ &= \tan \theta - \frac{\cos \theta}{\sin \theta} \\ \therefore \text{LHS} &= \text{RHS} \end{aligned}$	<p>OR</p> <p><input checked="" type="checkbox"/> $\sin^2 \theta + \cos^2 \theta$ <input checked="" type="checkbox"/> $\sin^2 \theta - \cos^2 \theta$ <input checked="" type="checkbox"/> $\frac{\sin \theta}{\cos \theta} - \frac{\cos \theta}{\sin \theta}$ <input checked="" type="checkbox"/> conclusion</p>	<p>(4)</p>

TOTAL = 50 MARKS

