



**LIMPOPO**

**PROVINCIAL GOVERNMENT**  
REPUBLIC OF SOUTH AFRICA

DEPARTMENT OF  
**EDUCATION**

**NATIONAL**  
**SENIOR CERTIFICATE**

**GRADE 11**

**MATHEMATICS**

**MARCH TEST**

**2025**

Stanmorephysics.com

**MARKS : 100**

**DURATION : 2 HOURS**

**This question paper consists of 4 pages.**

## INSTRUCTIONS AND INFORMATION

Read the following instructions carefully before answering the questions.

1. This question paper consists of SIX 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 Simplify without using a calculator:

1.1.1  $\frac{9x^{-2}}{27x^{-3}}$  (2)

1.1.2  $\frac{8^x \cdot 6^{x-1}}{27^{\frac{x}{3}} \cdot 16^x}$  (4)

1.1.3  $(0,25x^4y^8)^{\frac{1}{4}}$  (3)

1.1.4  $\frac{a^{-2} - b^{-2}}{b^2 - a^2}$  (3)

1.2 Simplify:  $\sqrt[3]{(\sqrt{13} - \sqrt{5})^6} \cdot \sqrt[3]{(\sqrt{13} + \sqrt{5})^6}$  (5)

1.3 Simplify:  $\frac{x-3}{x+3} - \frac{x+3}{x^2-9}$  (5)

**[22]**

**QUESTION 2**

Solve for  $x$ :

2.1  $(3x-5)(x+1) = 0$  (2)

2.2  $x^2 - 3x = 0$  (2)

2.3  $\frac{x}{2x+1} = \frac{2}{x+3}$  (5)

2.4  $2x^2 + 7x = 2$  (correct to two decimal places) (4)

2.5  $x^{\frac{2}{3}} = 4$  (4)

2.6  $\sqrt{x-3} - 4 = 5$  (4)

2.7  $9^x + 9 = 10 \cdot 3^x$  (5)

**[26]**

**QUESTION 3**

3.1 Solve for  $x$  in the following inequalities:

$2x^2 - 2 \geq 3x$  (4)

3.2 Solve for  $x$  and  $y$  for the following simultaneous equations:

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

3.3 Show that the roots of  $m^2 + mx - 12 = 0$  will be real and unequal if  $m > 0$  (4)

**[14]**

**QUESTION 4**

4.1 If  $\theta$  is a reflex angle and  $\tan \theta = -\frac{3}{4}$ , determine without the use of a calculator and the with the aid of a diagram, value of:

4.1.1  $\sin \theta$  (4)

4.1.2  $\cos(180^\circ - \theta)$  (2)

4.2 If  $\sin 17^\circ = a$ , WITHOUT using a calculator, express the following in terms of  $a$ :

4.2.1  $\tan 17^\circ$  (3)

4.2.2  $\sin 107^\circ$  (2)

4.2.3  $\cos^2 253^\circ + \sin^2 557^\circ$  (4)

[15]

**QUESTION 5**

5.1 Simplify the following fully, WITHOUT the use of a calculator:

$$\frac{\cos(-225^\circ) \cdot \sin 135^\circ + \sin 330^\circ}{\tan 225^\circ} \quad (6)$$

5.2 Simplify the following fully:

$$\frac{\sin(180^\circ - A) \cdot \tan A \cdot \sin(90^\circ + A)}{\tan(180^\circ + A) \cdot \sin(-A) \cdot \cos(-A)} \quad (6)$$

[12]

**QUESTION 6**

6.1 Prove that:  $(\sin x + \cos x)^2 = 1 + 2 \sin x \cdot \cos x$  (3)

6.2 Given:  $\frac{\sin x}{1 + \cos x} + \frac{\cos x}{\sin x} = \frac{1}{\sin x}$

6.2.1 Prove the given identity. (5)

6.2.2 For what values of  $x$  in the interval  $0^\circ \leq x \leq 360^\circ$  will the identity be undefined? (3)

[11]

**TOTAL: 100 MARKS**



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**GRADE 11**

**MATHEMATICS  
MARCH TEST  
2025  
MARKING GUIDELINES**

**MARKS : 100**

**These marking guidelines consist of 9 pages.**

QUESTION 1

1.1.1	$\frac{9x^{-2}}{27x^{-3}}$ $= \frac{3^2 x^3}{3^3 x^2}$ $= \frac{x}{3}$	<p>✓ apply exponent law</p> <p>✓ answer</p>	(2)
1.1.2	$\frac{8^x \cdot 6^{x-1}}{27^{\frac{x}{3}} \cdot 16^x}$ $= \frac{2^{3x} \cdot (2 \times 3)^{x-1}}{(3^3)^{\frac{x}{3}} \cdot 2^{4x}}$ $= \frac{2^{3x} \cdot 2^{x-1} \cdot 3^{x-1}}{3^x \cdot 2^{4x}}$ $= 2^{3x+x-1-4x} \cdot 3^{x-1-x}$ $= 2^{-1} \cdot 3^{-1}$ $= \frac{1}{6}$ 	<p>✓ prime number bases</p> <p>✓ apply exponent law</p> <p>✓ apply exponent law</p> <p>✓ answer</p>	(4)
1.1.3	$(0,25x^4y^8)^{\frac{1}{4}}$ $= (2^{-2}x^4y^8)^{\frac{1}{4}}$ $= 2^{\frac{1}{2}}x^{-1}y^{-2}$ $= \frac{2^{\frac{1}{2}}}{xy^2} \text{ or } \frac{\sqrt{2}}{xy^2}$	<p>✓ prime number bases</p> <p>✓ apply exponent law</p> <p>✓ answer</p>	(3)
1.1.4	$\frac{a^{-2} - b^{-2}}{b^2 - a^2}$ $= \frac{\frac{1}{a^2} - \frac{1}{b^2}}{b^2 - a^2}$ $= \frac{\frac{b^2 - a^2}{a^2 b^2}}{b^2 - a^2}$ $= \frac{b^2 - a^2}{a^2 b^2} \times \frac{1}{b^2 - a^2}$ $= \frac{1}{a^2 b^2}$	<p>✓ apply exponent law</p> <p>✓ lcm</p> <p>✓ answer</p>	(3)

1.2	$\begin{aligned} & \sqrt[3]{(\sqrt{13}-\sqrt{5})^6} \cdot \sqrt[3]{(\sqrt{13}+\sqrt{5})^6} \\ &= (\sqrt{13}-\sqrt{5})^2 \cdot (\sqrt{13}+\sqrt{5})^2 \\ &= (13-2\sqrt{13}\sqrt{5}+5) \cdot (13+2\sqrt{13}\sqrt{5}+5) \\ &= (18-2\sqrt{13}\sqrt{5}) \cdot (18+2\sqrt{13}\sqrt{5}) \\ &= (18)^2 - (2\sqrt{13}\sqrt{5})^2 \\ &= 64 \end{aligned}$	<ul style="list-style-type: none"> <li>✓ method</li> <li>✓ simplification</li> <li>✓ simplification</li> <li>✓ method</li> <li>✓ answer</li> </ul>	(5)
1.3	$\begin{aligned} & \frac{x-3}{x+3} - \frac{x+3}{x^2-9} \\ &= \frac{x-3}{x+3} - \frac{x+3}{(x+3)(x-3)} \\ &= \frac{(x-3)(x-3) - (x+3)}{(x+3)(x-3)} \\ &= \frac{x^2-6x+9-x-3}{(x+3)(x-3)} \\ &= \frac{x^2-7x+6}{(x+3)(x-3)} \end{aligned}$	<ul style="list-style-type: none"> <li>✓ <math>(x-3)(x+3)</math></li> <li>✓ lcd</li> <li>✓ <math>x^2-6x+9</math> ✓ <math>-x-3</math></li> <li>✓ answer</li> </ul>	(5)
			<b>[22]</b>

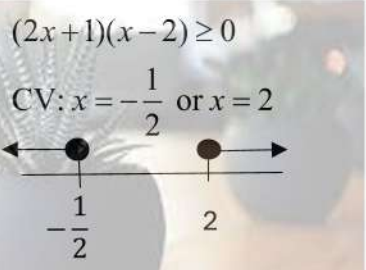
**QUESTION 2**


2.1	$(3x-5)(x+1) = 0$ $\therefore x = \frac{5}{3} \text{ or } x = -1$	<ul style="list-style-type: none"> <li>✓ <math>x = \frac{5}{3}</math> ✓ <math>x = -1</math></li> </ul>	(2)
2.2	$x^2 - 3x = 0$ $x(x-3) = 0$ $x = 0 \text{ or } x = 3$	<ul style="list-style-type: none"> <li>✓ common factor</li> <li>✓ answer</li> </ul>	(2)

<p>2.3</p>	$\frac{x}{2x+1} = \frac{2}{x+3}$ $x(x+3) = 2(2x+1)$ $x^2 + 3x = 4x + 2$ $x^2 + 3x - 4x - 2 = 0$ $x^2 - x - 2 = 0$ $(x-2)(x+1) = 0$ $\therefore x = 2 \text{ or } x = -1$	<ul style="list-style-type: none"> <li>✓ method</li> <li>✓ simplifying</li> <li>✓ standard form</li> <li>✓ factor</li> <li>✓ answer</li> </ul>	<p>(5)</p>
<p>2.4</p>	$2x^2 + 7x = 2$ $2x^2 + 7x - 2 = 0$ $x = \frac{-7 \pm \sqrt{(7)^2 - 4(2)(-2)}}{2(2)}$ $x = \frac{-7 \pm \sqrt{65}}{4}$ $\therefore x = 0,27 \text{ or } x = -3,77$	<ul style="list-style-type: none"> <li>✓ standard form</li> <li>✓ substitution</li> <li>✓ simplifying</li> <li>✓ both answers</li> </ul>	<p>(4)</p>
<p>2.5</p>	$\frac{2}{x^3} = 4$ $\left(\frac{2}{x^3}\right)^3 = 4^3$ $x^2 = 64$ $\sqrt{x^2} = \pm\sqrt{64}$ $\therefore x = \pm 8$ <p>OR</p> $\frac{2}{x^3} = 4$ $\left(\frac{2}{x^3}\right)^3 = 4^3$ $x^2 = 64$ $x^2 - 64 = 0$ $(x+8)(x-8) = 0$ $\therefore x = -8 \text{ or } x = 8$	<ul style="list-style-type: none"> <li>✓ simplifying</li> <li>✓ simplifying</li> <li>✓✓ both answers</li> <li>✓ simplifying</li> <li>✓ factors</li> <li>✓✓ both answers</li> </ul>	<p>(4)</p>
<p>2.6</p>	$\sqrt{x-3} - 4 = 5$ $\sqrt{x-3} = 9$ $(\sqrt{x-3})^2 = (9)^2$ $x-3 = 81$ $\therefore x = 84$	<ul style="list-style-type: none"> <li>✓ isolating surd</li> <li>✓ squaring both sides</li> <li>✓ simplifying</li> <li>✓ answer</li> </ul>	<p>(4)</p>

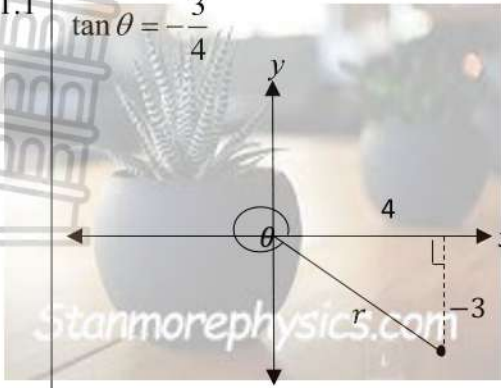


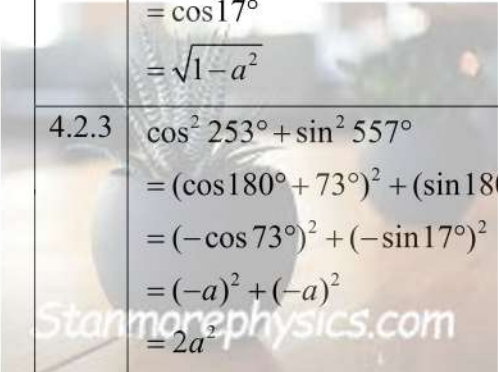
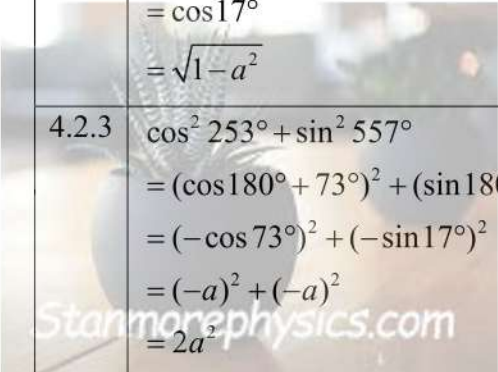
<p>2.7</p>	$9^x + 9 = 10 \cdot 3^x$ $3^{2x} - 10 \cdot 3^x + 9 = 0$ <p>Let <math>k = 3^x</math></p> $k^2 - 10k + 9 = 0$ $(k-1)(k-9) = 0$ $k = 1 \text{ or } k = 9$ $\therefore 3^x = 3^0 \text{ or } 3^x = 3^2$ $\therefore x = 0 \text{ or } x = 2$ <p>ALTERNATIVE METHOD:</p> $9^x + 9 = 10 \cdot 3^x$ $3^{2x} - 10 \cdot 3^x + 9 = 0$ $(3^x - 1)(3^x - 9) = 0$ $3^x = 1 \text{ or } 3^x = 9$ $\therefore 3^x = 3^0 \text{ or } 3^x = 3^2$ $\therefore x = 0 \text{ or } x = 2$	<ul style="list-style-type: none"> <li>✓ standard form</li> <li>✓ <math>k</math>-method</li> <li>✓ factors</li> <li>✓ both answers for <math>k</math></li> <li>✓ answer</li> </ul> <ul style="list-style-type: none"> <li>✓ standard form</li> <li>✓ factors</li> <li>✓ both answers for <math>x</math></li> <li>✓ prime number base</li> <li>✓ answer</li> </ul>	<p>(5)</p>
			<p>[26]</p>

**QUESTION 3**

<p>3.1</p>	$2x^2 - 2 \geq 3x$ $2x^2 - 3x - 2 \geq 0$ $(2x+1)(x-2) \geq 0$ <p>CV: <math>x = -\frac{1}{2}</math> or <math>x = 2</math></p>  $x \leq -\frac{1}{2} \text{ or } x \geq 2$	<ul style="list-style-type: none"> <li>✓ standard form</li> <li>✓ factors</li> <li>✓ critical values</li> </ul> <ul style="list-style-type: none"> <li>✓ answer</li> </ul>	<p>(4)</p>
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<p>3.2</p>	<p><math>2y^2 + 4xy = 6x^2 \dots \textcircled{1}</math></p> <p><math>y - 2x = -1 \dots \textcircled{2}</math></p> <p>From <math>\textcircled{2}</math> then:</p> <p><math>y = 2x - 1 \dots \textcircled{3}</math></p> <p>Substitute <math>\textcircled{3}</math> into <math>\textcircled{1}</math></p> <p><math>2(2x - 1)^2 + 4x(2x - 1) = 6x^2</math></p> <p><math>2(4x^2 - 4x + 1) + 8x^2 - 4x - 6x^2 = 0</math></p> <p><math>8x^2 - 8x + 2 + 2x^2 - 4x = 0</math></p> <p><math>10x^2 - 12x + 2 = 0</math></p> <p><math>5x^2 - 6x + 1 = 0</math></p> <p><math>(5x - 1)(x - 1) = 0</math></p> <p><math>x = \frac{1}{5}</math> or <math>x = 1</math></p> <p><math>y = 2\left(\frac{1}{5}\right) - 1</math> or <math>y = 2(1) - 1</math></p> <p><math>y = -\frac{3}{5}</math> or <math>y = 1</math></p> 	<p>✓ ...<math>\textcircled{3}</math></p> <p>✓ substitution</p> <p>✓ simplifying</p> <p>✓ standard form</p> <p>✓ values of <math>x</math></p> <p>✓ values of <math>y</math></p>	<p>(6)</p>
<p>3.3</p>	<p><math>m^2 + mx - 12 = 0</math></p> <p><math>\Delta = (m)^2 - 4(m)(-12)</math></p> <p><math>\Delta = m^2 + 48m</math></p> <p><math>m^2 &gt; 0</math> if <math>m &gt; 0</math> and</p> <p><math>48m &gt; 0</math> if <math>m &gt; 0</math></p> <p><math>\therefore \Delta &gt; 0</math></p>	<p>✓ substitution</p> <p>✓ <math>\Delta</math></p> <p>✓ <math>m^2 &gt; 0</math></p> <p>✓ <math>48m &gt; 0</math></p>	<p>(4)</p>
			<p><b>[14]</b></p>

QUESTION 4

<p>4.1.1</p>	<p><math>\tan \theta = -\frac{3}{4}</math></p>  <p><math>r^2 = (4)^2 + (-3)^2</math> Pythagoras</p> <p><math>r^2 = 25</math></p> <p><math>\therefore r = 5</math></p> <p><math>\therefore \sin \theta = -\frac{3}{5}</math></p> 	<p>✓ diagram</p> <p>✓ substitution</p> <p>✓ value of <math>r</math></p> <p>✓ answer</p>	<p>(4)</p>
<p>4.1.2</p>	<p><math>\cos(180^\circ - \theta)</math></p> <p><math>= -\cos \theta</math></p> <p><math>= -\frac{4}{5}</math></p> 	<p>✓ <math>= -\cos \theta</math></p> <p>✓ answer</p>	<p>(2)</p>
<p>4.2.1</p>	<p><math>\sin 17^\circ = \frac{a}{1}</math></p> <p><math>x^2 = (1)^2 - (a)^2</math></p> <p><math>\therefore x = \sqrt{1 - a^2}</math></p> <p><math>\tan 17^\circ = \frac{a}{\sqrt{1 - a^2}}</math></p>	<p>✓ substitution</p> <p>✓ value of <math>x</math></p> <p>✓ answer</p>	<p>(3)</p>
<p>4.2.2</p>	<p><math>\sin 107^\circ</math></p> <p><math>= \sin(90^\circ + 17^\circ)</math></p> <p><math>= \cos 17^\circ</math></p> <p><math>= \sqrt{1 - a^2}</math></p> 	<p>✓ <math>\cos 17^\circ</math></p> <p>✓ answer</p>	<p>(2)</p>
<p>4.2.3</p>	<p><math>\cos^2 253^\circ + \sin^2 557^\circ</math></p> <p><math>= (\cos 180^\circ + 73^\circ)^2 + (\sin 180^\circ + 17^\circ)^2</math></p> <p><math>= (-\cos 73^\circ)^2 + (-\sin 17^\circ)^2</math></p> <p><math>= (-a)^2 + (-a)^2</math></p> <p><math>= 2a^2</math></p> 	<p>✓ <math>\cos 73^\circ</math> ✓ <math>-\sin 17^\circ</math></p> <p>✓ method</p> <p>✓ answer</p>	<p>(4)</p>
			<p>[15]</p>

QUESTION 5

<p>5.1</p>	$\frac{\cos(-225^\circ) \cdot \sin 135^\circ + \sin 330^\circ}{\tan 225^\circ}$ $= \frac{\cos 225^\circ \cdot \sin 135^\circ + \sin 330^\circ}{\tan 225^\circ}$ $= \frac{\cos(180^\circ + 45^\circ) \cdot \sin(180^\circ - 45^\circ) + \sin(360^\circ - 30^\circ)}{\tan(180^\circ + 45^\circ)}$ $= \frac{-\cos 45^\circ \cdot \sin 45^\circ - \sin 30^\circ}{\tan 45^\circ}$ $= \frac{-\frac{1}{\sqrt{2}} \cdot \frac{1}{\sqrt{2}} - \frac{1}{2}}{1}$ $= -\frac{1}{2} - \frac{1}{2}$ $= -1$	<p>✓ <math>-\cos 45^\circ</math></p> <p>✓ <math>\sin 45^\circ</math></p> <p>✓ <math>-\sin 45^\circ</math></p> <p>✓ <math>\tan 45^\circ</math></p> <p>✓ substitution</p> <p>✓ answer</p>	<p>(6)</p>
<p>5.2</p>	$\frac{\sin(180^\circ - A) \cdot \tan A \cdot \sin(90^\circ + A)}{\tan(180^\circ + A) \cdot \sin(-A) \cdot \cos(-A)}$ $= \frac{\sin A \cdot \tan A \cdot \cos A}{\tan A \cdot (-\sin A) \cdot \cos A}$ $= -1$	<p>✓ <math>\sin A</math> ✓ <math>\cos A</math> ✓ <math>\tan A</math></p> <p>✓ <math>-\sin A</math> ✓ <math>\cos A</math></p> <p>✓ answer</p>	<p>(6)</p>
			<p>[12]</p>

**QUESTION 6**

6.1	$(\sin x + \cos x)^2 = 1 + 2 \sin x \cdot \cos x$ <p>LHS: <math>(\sin x + \cos x)^2</math>                      LHS: <math>\sin^2 x + 2 \sin x \cos x + \cos^2 x</math>                      LHS: <math>1 + 2 \sin x \cos x</math>                      LHS = RHS</p>	<p>✓ <math>\sin^2 x + \cos^2 x</math>                      ✓ <math>2 \sin x \cos x</math>                      ✓ 1</p>	(3)
6.2.1	$\frac{\sin x}{1 + \cos x} + \frac{\cos x}{\sin x} = \frac{1}{\sin x}$ <p>LHS: <math>\frac{\sin x}{1 + \cos x} + \frac{\cos x}{\sin x}</math>                      LHS: <math>\frac{\sin^2 x + \cos x(1 + \cos x)}{(1 + \cos x) \cdot \sin x}</math>                      LHS: <math>\frac{\sin^2 x + \cos x + \cos^2 x}{(1 + \cos x) \cdot \sin x}</math>                      LHS: <math>\frac{1 + \cos x}{(1 + \cos x) \cdot \sin x}</math>                      LHS: <math>\frac{1}{\sin x}</math>                      LHS = RHS</p>	<p>✓ Numerator                      ✓ LCD                      ✓ Simplifying                      ✓ 1                      ✓ Simplifying</p>	(5)
6.2.2	$x = 0^\circ; 180^\circ; 360^\circ$	<p>✓ <math>0^\circ</math> ✓ <math>180^\circ</math> ✓ <math>360^\circ</math></p>	(3)
			<b>[11]</b>

**TOTAL: 100 MARKS**