



education

Department of
Education
FREE STATE PROVINCE

GRADE 12

MATHEMATICS

GRADE 12

INFORMAL TEST 4

09 FEBRUARY 2024

MARKS: 50

DURATION: 60 MINUTES



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 **4** 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. which 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 otherwise stated.
7. If necessary, round off answers to **TWO** decimal places, unless stated otherwise



QUESTION 1

1. Solve for x :

- 1.1 $(-1+2x)(x+4)=0$ (2)
- 1.2 $3x^2 - x = 5$ (Leave your answer correct to TWO decimal places) (4)
- 1.3 $x^2 + 7x - 8 \leq 0$ (4)

[10]

QUESTION 2

- 2.1 $3x + 1 ; 2x ; 3x - 7$ are the first three terms of an arithmetic sequence. Calculate the value of x . (2)
- 2.2 The first and second terms of an arithmetic sequence are 10 and 6 respectively.
- 2.2.1 Calculate the 11th term of the sequence. (2)
- 2.2.2 The sum of the first n terms of this sequence is -560 . Calculate n . (6)

[10]

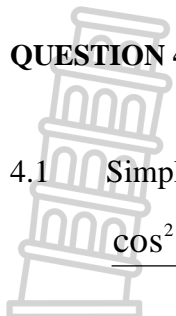
QUESTION 3

- 3.1 Given: $f(x) = 2x - 3$
- 3.1.1 Write down the equation of the inverse in the form $f^{-1}(x) =$ (2)
- 3.1.2 Write down the domain of f^{-1} . (2)
- 3.1.3 Sketch the graphs of f and f^{-1} . (3)
- 3.1.4 For which value(s) of x will $f^{-1}(x) = f(x)$. (3)
- 3.2 Given: $f(x) = x^2$
- 3.2.1 Sketch the graph of h . (2)
- 3.2.2 Determine the inverses of h in the form $y = \dots$ (2)
- 3.2.3 Give a reason why the inverse of h is not a function. (1)
- 3.2.4 Write down TWO ways in which you could restrict the domain of h so that the inverse the its inverse is a function. (2)
- 3.2.5 Sketch the graph of the function h^{-1} on the same set of axes. (3)

[20]

QUESTION 4

4.1 Simplify to a single trigonometric ratio of x :


$$\frac{\cos^2 225^\circ \cdot \tan(180^\circ + x) \cdot \sin(90^\circ + x)}{\sin(-x)} \quad (6)$$

4.2 Calculate θ if $\sqrt{3}\sin\theta = 3\cos\theta$ and $\theta \in [-180^\circ; 180^\circ]$ (4)

[10]





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NATIONAL SENIOR CERTIFICATE

GRADE 12

MATHEMATICS

TERM 1

2024 INFORMAL TEST 4

Stanmorephysics.com

MARKING GUIDELINE

This marking guideline consists of 6 pages

QUESTION 1

1.1	$(-1+2x)(x+4)=0$ $x = \frac{1}{2} \text{ and } x=4$	✓ ✓ answers (2)
1.2	$3x^2 - x = 5$ $3x^2 - x - 5 = 0$ $= \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$ $= \frac{-(-1) \pm \sqrt{(-1)^2 - 4(3)(-5)}}{2(3)}$ $= \frac{1 \pm \sqrt{61}}{6}$ $x = 1,47 \text{ and } x = -1,14$	✓ standard form ✓ substitution ✓ ✓ answer (4)
1.3	$x^2 + 7x - 8 \leq 0$ $(x+1)(x-8) \leq 0$ CV: -1 and 8 $-1 \leq x \leq 8$	✓ factors ✓ Critical values ✓ ✓ answer (4)
[10]		

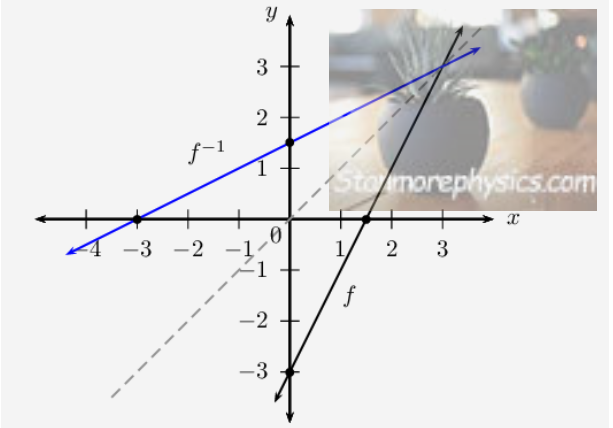


QUESTION 2

<p>2.1</p>	$T_2 - T_1 = T_3 - T_2$ $2x - (3x + 1) = (3x - 7) - 2x$ $2x - 3x - 1 = 3x - 7 - 2x$ $-x - 1 = x - 7$ $-2x = -6$ $x = 3$ <p>OR</p> $T_2 = \frac{T_1 + T_3}{2}$ $2x = \frac{(3x + 1) + (3x - 7)}{2}$ $4x = 6x - 6$ $6 = 2x$ $x = 3$ <p>OR</p> $T_3 - T_1 = 2(T_2 - T_1)$ $(3x - 7) - (3x + 1) = 2(2x - (3x + 1))$ $-8 = -2x - 2$ $2x = 6$ $x = 3$	<p>✓ $T_2 - T_1 = T_3 - T_2$ or $2x - (3x + 1) = (3x - 7) - 2x$</p> <p>✓ answer (2)</p> <p>✓ $T_2 = \frac{T_1 + T_3}{2}$ or $2x = \frac{(3x + 1) + (3x - 7)}{2}$</p> <p>✓ answer (2)</p> <p>✓ $T_3 - T_1 = 2(T_2 - T_1)$ or $(3x - 7) - (3x + 1) = 2(2x - (3x + 1))$</p> <p>✓ answer (2)</p>
<p>2.2.1</p>	$T_n = a + (n - 1)d$ $T_{11} = 10 + (11 - 1)(-4)$ $= -30$ <p>OR</p> <p>10; 6; 2; -2; -6; -10; -14; -18; -22; -26; -30 ... ∴ $T_{11} = -30$</p>	<p>✓ $d = -4$ ✓ answer (2)</p> <p>✓ expands sequence ✓ answer (2)</p>

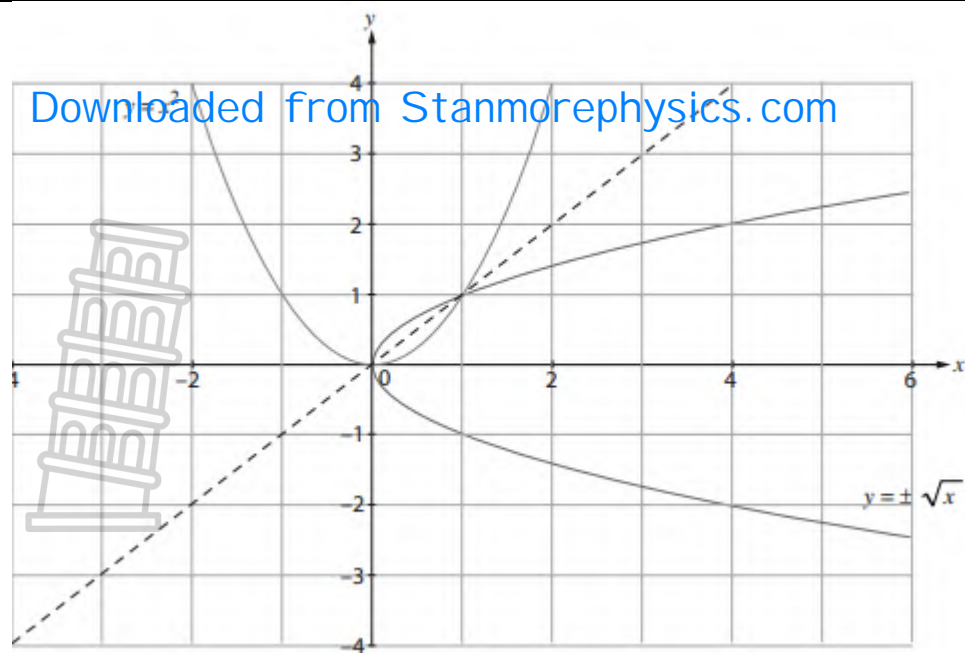
2.2.2	<p style="text-align: right; color: blue;">Downloaded from Stanmorephysics.com</p> $S_n = \frac{n}{2}[2a + (n-1)d]$ $-560 = \frac{n}{2}[2(10) + (n-1)(-4)]$ $-1120 = -4n^2 + 24n$ $n^2 - 6n - 280 = 0$ $(n-20)(n+14) = 0$ $n = 20 \text{ or } n = -14$ $\therefore n = 20 \text{ only}$	<ul style="list-style-type: none"> ✓ correct formula ✓ substitution ✓ standard form ✓ factors ✓ answers ✓ $\therefore n = 20$ only (6)
		[10]

QUESTION 3

3.1.1	$f(x) = 2x - 3$ $y = 2x - 3$ $x = 2y - 3$ $f^{-1} = \frac{x+3}{2}$	<ul style="list-style-type: none"> ✓ swop x and y ✓ answer (2)
3.1.2	The domain of $f^{-1}\{x : x \in \mathbb{R}\}$	<ul style="list-style-type: none"> ✓ ✓ answer (2)
3.1.3		<ul style="list-style-type: none"> ✓ shape, intercepts with the axes (f) ✓ intercepts with the axes (f^{-1}) ✓ shape (f^{-1}) (3)

3.1.4	$f^{-1} = \frac{x+3}{2}$ <p>Downloaded from Stanmorephysics.com</p> $f(x) = f^{-1}(x)$ $2x - 3 = \frac{x+3}{2}$ $4x - 6 = x + 3$ $x = 3$	<p>✓ $f^{-1} = \frac{x+3}{2}$</p> <p>✓ equating</p> <p>✓ answer (3)</p>
3.2.1		<p>✓ shape</p> <p>✓ intercepts with the axis (2)</p>
3.2.2	$f(x) = x^2$ $y = x^2$ $x = y^2$ $y = \pm\sqrt{x}$	<p>✓ swap x and y</p> <p>✓ answer (2)</p>
3.2.3	<p>This inverse has two points, that share a common x-value but have different y-values. This means that the inverse is NOT a function. (one-to-many)</p>	<p>✓ answer (1)</p>
3.2.3	$x \leq 0 \text{ and } x \geq 0$	<p>✓ $x \leq 0$</p> <p>✓ $x \geq 0$ (2)</p>

3.2.4



- ✓ shape
- ✓ intercepts with axis
- ✓ point of intersection (3)

[20]

QUESTION 4

4.1	$\frac{(-\cos 45^\circ)^2 \cdot (\tan x) \cdot (-\sin x)}{-\sin x}$ $= \left(-\frac{1}{\sqrt{2}}\right)^2 \cdot \tan x$ $= \frac{1}{2} \tan x$	<ul style="list-style-type: none"> ✓✓✓✓ reductions ✓ value special angle ✓ answer (6)
4.2	$3 \cos \theta = \sqrt{3} \sin \theta$ $\frac{\sin \theta}{\cos \theta} = \frac{3}{\sqrt{3}}$ $\tan \theta = \frac{3}{\sqrt{3}}$ $\theta = 60^\circ + 180.n$ $\theta = -120^\circ \text{ or } \theta = 60^\circ$	<ul style="list-style-type: none"> ✓ division ✓ $\tan \theta = \frac{3}{\sqrt{3}}$ ✓✓ answer (4)
[10]		