



Province of the
EASTERN CAPE
EDUCATION

OR TAMBO COASTAL DISTRICT

**NATIONAL
SENIOR CERTIFICATE**

GRADE 12

MATHEMATICS INVESTIGATION

FUNCTIONS AND INVERSES

LAST DAY OF SUBMISSION: 16 February 2024

MARKS: 50

This investigation consists of 9 pages, with a DIAGRAM SHEET for QUESTION 2.2, 2.3, 2.4, 3.1.3, 3.1.7(a) and 3.1.7(b)

Instructions

1. This investigation consists of three parts.
2. Answer all the three parts.
3. Use of different colouring pens for different graphical representations is recommended for clear illustrations.

PART-1 : WHAT CONSTITUTES A FUNCTION?

TYPES OF RELATIONS

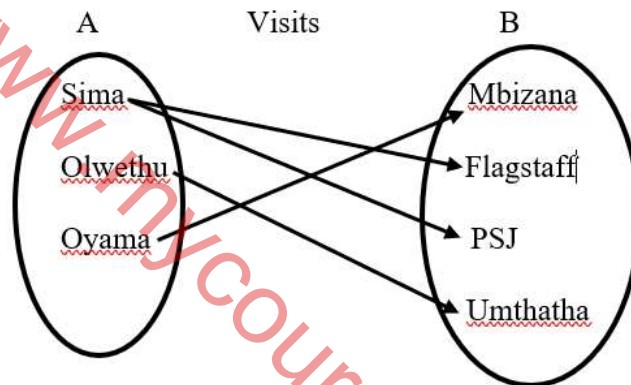
ONE-to-ONE Relation: For every input value there is only one output value.

MANY-to-ONE Relation: For more than one input value there is one output value.

ONE-to-MANY Relation: For one input value there is more than one output value.

1.1 Determine the type of a relation in each case and give a reason for your answer:

1.1.1.

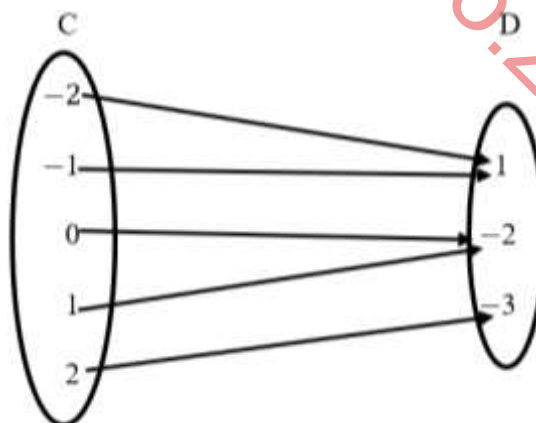


(1)

1.1.2. $\{(2;4), (3;6), (5;7), (7;8)\}$

(1)

1.1.3.



(1)

DEFINITION OF A FUNCTION

A function is a set of ordered pairs where no two ordered pairs have the same x -coordinates, or, it is a set of ordered pairs where, for every value of x there is one and only one value of y . However, for the same value of y there may be different values of x .

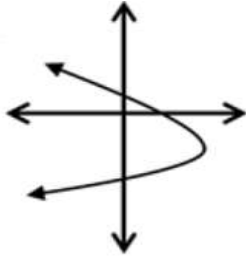
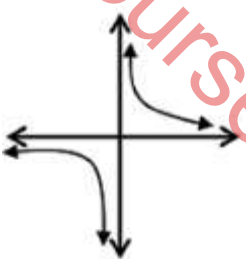
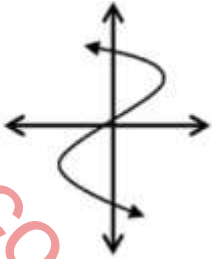
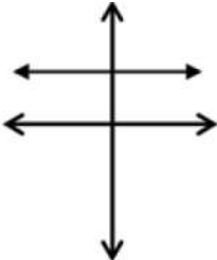
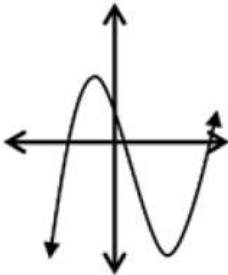
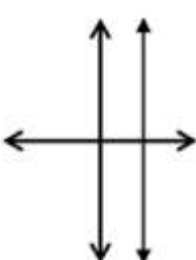
- 1.2. Which of the relations in 1.1.1 – 1.1.3 is / are functions(s)? Explain your answer. (4)

VERTICAL LINE TEST OF A GRAPH

A vertical line method is used to test whether a graph drawn represents a function or not.

A vertical line is drawn across a graph. If the vertical line intersects the graph more than once, then the graph represents a non-function, but if the vertical line intersects the graph only once, then the graph represents a function.

- 1.3. Determine whether each of the following graphs is a function or not. In each case explain your answer.

1.3.1 	1.3.2 	1.3.3 
(1)	(1)	(1)
1.3.4 	1.3.5 	1.3.6 
(1)	(1)	(1)

[13]

PART-2 : THE INVERSE OF AN EXPONENTIAL FUNCTION

2.1 Consider the equation of $g(x)=2^x$.

Complete the following table:

x	-3	-2	-1	0	1	2
y						

(1)

2.2 Use the DIAGRAM SHEET provided to sketch the graph of $g(x)$. (2)

2.3 Sketch the graph of $f(x) = x$ as a dotted line, on the same set of axes as that of g in 2.2. above. (1)

2.4 Complete the table below for h , if h is a result of the x and y values of g interchanged:

x						
y						

On the same set of axes in question 2.2, sketch the graph of h . (4)

2.5 Hence, write down the x -intercepts of the following graphs:

	$y = 2^x$	$x = 2^y$
x -intercept(s)2.5.1.....2.5.2.....

(2)

2.6 Write the domain and range of the following graphs:

	$y = 2^x$	$x = 2^y$
Domain2.6.1.....2.6.2.....
Range2.6.3.....2.6.4.....

(4)

2.6.5 What is the relationship between the domains and the ranges of the two graphs in 2.6.1 – 2.6.4? (1)

2.6.6 Which of the two graphs above is not a function? Explain your answer. (2)

2.6.7 Write the equation of $x = 2^y$ in the form of $y = \dots\dots\dots$ (1)

2.6.8 Draw and write the equation of the line of symmetry for the two graphs. (1)

2.6.9 In Mathematics h is called the inverse of g . Write a conjecture about the graph and its inverse. (3)

[22]

PART – 3 : WHEN IS THE INVERSE OF A PARABOLIC FUNCTION A FUNCTION ITSELF?

- 3.1 Given : $f(x) = 2x^2$, for $x \in \mathbb{R}$
- 3.1.1 Write down the equation of the inverse of f . (1)
- 3.1.2 Write down the turning points of both f and its inverse. (2)
- 3.1.3 Sketch the graphs of f and its inverse on the same DIAGRAM SHEET for QUESTION 3.1.3 provided. (2)
- 3.1.4 Is the inverse of f a function or not. Explain. (2)
- 3.1.5 Explain how you would restrict the domain of f so that its inverse is a function. (2)
- 3.1.6 Hence, write down the corresponding range for the inverse of f if :
- (a) $x \leq 0$ (1)
- (b) $x \geq 0$ (1)
- 3.1.7 On separate sets of axes, sketch the graphs of the inverse of f with restricted domains as in QUESTION 3.1.6. Indicate the domain and the range of each. (2)
- 3.1.8 Are the two graphs in Question 3.1.7 function? Give reasons for your answer. (2)
- [15]**

TOTAL : 50

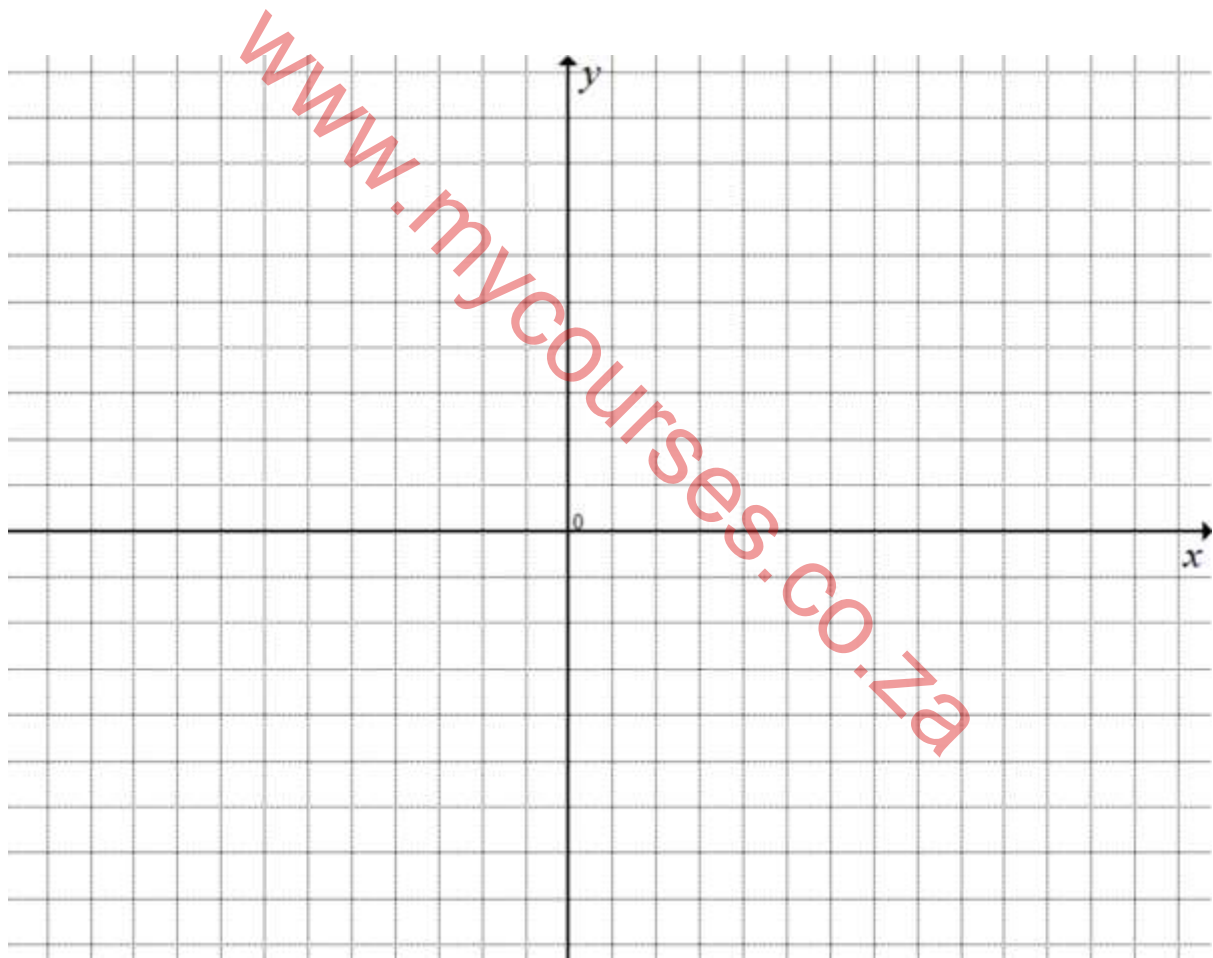
DIAGRAM SHEET

LEARNER NAME:..... **CLASS :**.....

SCHOOL NAME :.....

PART:2

QUESTION 2.2, 2.3 and 2.4

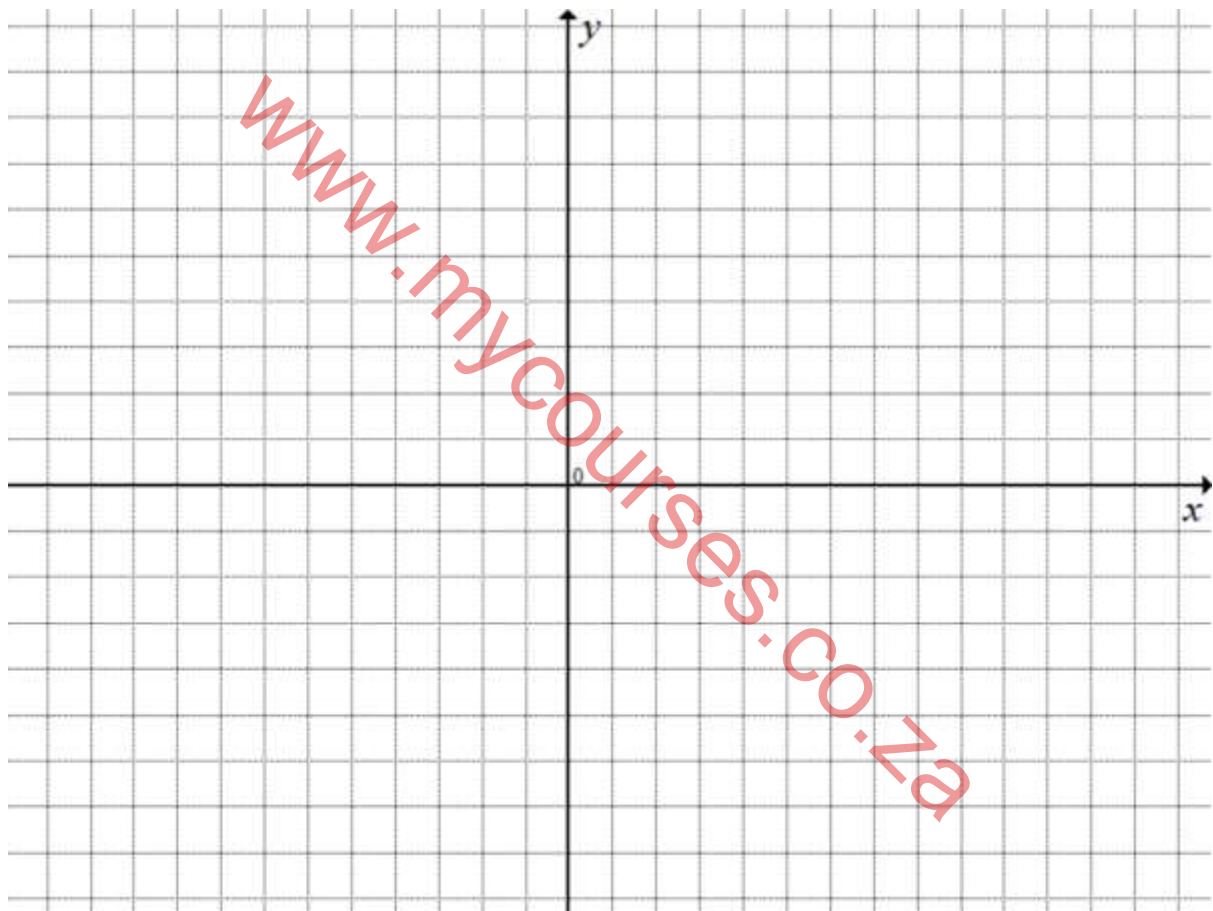


LEARNER NAME:..... CLASS :.....

SCHOOL NAME :.....

PART: 3

QUESTION 3.1.3

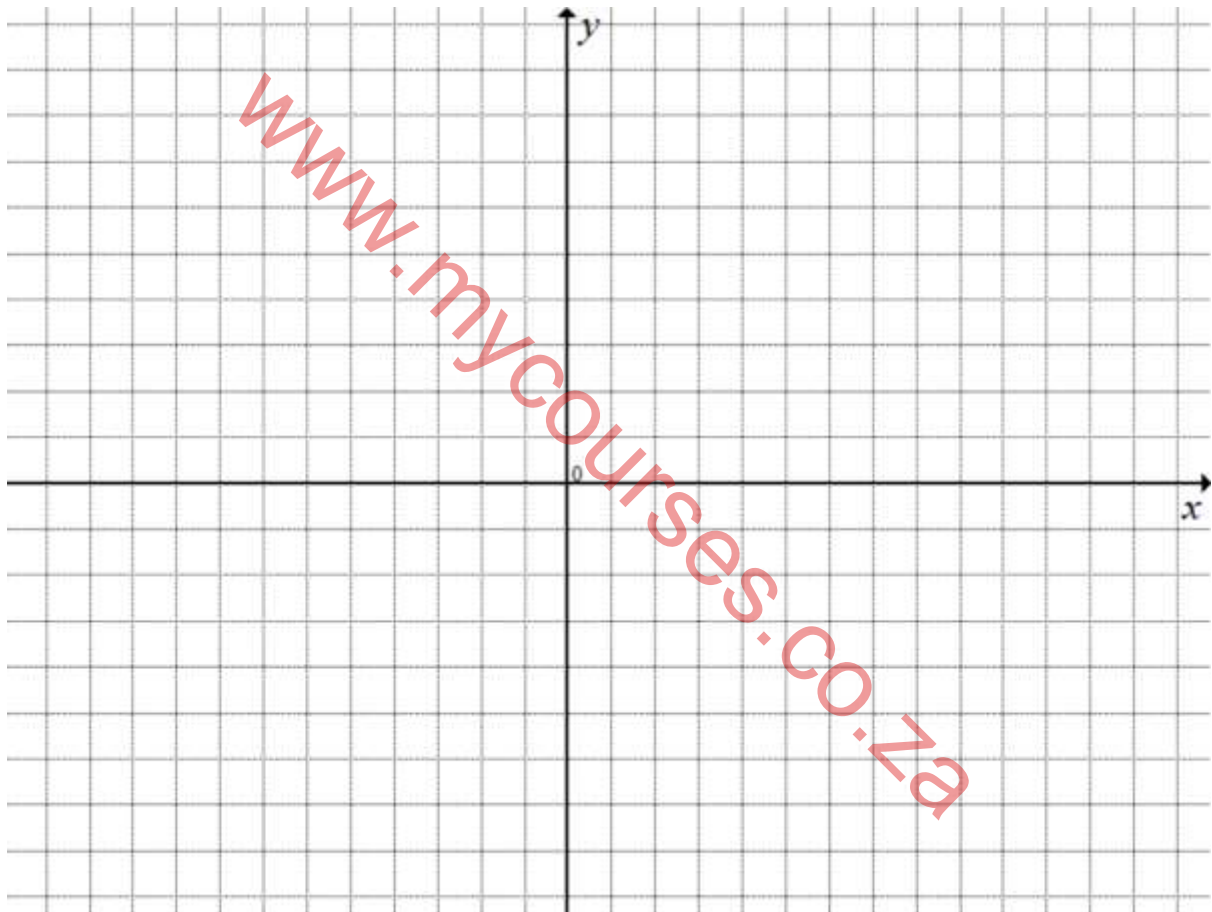


LEARNER NAME:..... CLASS :.....

SCHOOL NAME :.....

PART: 3

QUESTION 3.1.7 (a)



LEARNER NAME:..... CLASS :.....

SCHOOL NAME :.....

PART: 3

QUESTION 3.1.7 (b)

