

Add math 1 function essay



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Learning Objectives : Understand the concept of relations Learning

Outcomes : Student will be able to 1. 1 Represent relation using a) arrow diagram , b) ordered pairs, c)graphs 1.

2 Identify domain, co domain, object, image and range of a relation. . 3

Classify a relation shown on the mapped diagram as : one to one many to one , one to many or many to many 1. 1a Representing a relation between two sets by using an arrow diagram Example 1 Suppose we have set $A = \{ 0, 1, 2, 3 \}$ and set $B = \{ 0, 1, 2, 3, 4, 5, 6 \}$.

Let us examine the relations “ is one less than “ from set A to Set B . One way to show the relations is to draw an arrow diagram as shown below . The arrows relate the elements in A to the elements in B A is one less than B •6 •5 In the space below give other example to show a relation 3 2 1 0 . FIG 1.

1 4 3 2 . 1 •0A relation from set A to set B is an association of elements of A with elements of B . Exercise 1 1 Two set of numbers, P and Q are shown below Complete the arrow diagram to show the relations “ is grater than “ from set P to set Q P is grater then • 2. What relation from set S to set T is illustrated in diagram below . Write your answer in the box below Q 10 8 6 1 .

8 3 2 1 3 2 1 -1 . 6 4 2 •1 -2 3. Construct an arrow diagram to show the relation “ is a factor of “ from set $A = \{2, 5, 7, 13 \}$ to set $B = \{1, 4, 15, 35, 40\}$ 4. Construct an arrow diagram to show the relation “ is a multiple of “ from set $A = \{1, 2, 3, 4, 5, 6 \}$ to set $B = \{2, 3, 5\}$ 1. 1(b) Representing a relation between two sets by using an ordered pairs The relation can also be shown concisely by ordered pairs (1, 2) . The elements in the pair are in

order since the first element comes from the first set A and the second element comes from the second set B .

We have $A = \{0, 1, 2, 3\}$ and $B = \{0, 1, 2, 3, 4, 5, 6\}$. If $x \in A$ (this means that x is a member of A) and $y \in B$, the set of all ordered pairs (x, y) is $\{(0, 1), (1, 2), (2, 3), (3, 4)\}$. This set of ordered pairs defines the relations " is one less than " from set A to set B

Example 2 1. $A = \{1, 2, 3, 4, 5, 6\}$ and $B = \{2, 3, 5\}$. Show the relation " is a multiple of" from A to B as a set of ordered pairs

Solution The ordered pairs $= \{(2, 2), (3, 3), (4, 2), (5, 5), (6, 2), (6, 3)\}$

2. Write down the relation as a set of ordered pairs " is factor of " from set $A = \{2, 5, 7, 13\}$ to set $B = \{1, 4, 15, 35, 40\}$

Solution The ordered pairs $= \{(2, 4), (2, 40), (5, 15), (5, 35), (5, 40), (7, 35)\}$

Exercise 1.

1 (b) 1. A relation between two sets is defined by the set of ordered pairs , $\{(-1, 2), (1, 4), (3, 6), (5, 8), (7, 10)\}$ List the elements of the two sets, and describe in words a possible relation between the first set and the second set

2. Given that $A = \{2, 4, 6, 8\}$ and $B = \{1, 2, 3, 4, 5\}$ If $x \in A$ and $y \in B$, list the set of ordered pairs in the relation x " is double " y

3. Given that $X = \{0, 1, 2, 3\}$ and $Y = \{0, 1, 2, 3, 4, 5, 6\}$ If $x \in X$ and $y \in Y$, list the set of ordered pairs in the relation x " is one less than " y

4. A relation R is defined by $\{(1, 8), (1, 4), (2, 2), (4, 1), (8,)\}$

2 2 List the set of first members of pairs, and set of second members of the pairs .

Describe in words a possible relation between the first set and the second set.

1. 1(c) Representing a relation between two sets using a graphs We can plot an ordered pairs in a Cartesian graph of the relations

Example 3 1. We have $A = \{0, 1, 2, 3\}$ and $B = \{0, 1, 2, 3, 4, 5, 6\}$. If $x \in A$ and $y \in B$, the set of

all ordered pairs (x, y) is $(0, 1), (1, 2), (2, 3), (3, 4)$ we can plot a Cartesian graph to show the relation. 2. Given that $A = B = \{1, 2, 3, 4, 5\}$ If $x \in A$ and $y \in B$, and the relation x "less than" y Illustrate the relation by means of a Cartesian graph.

Set B • • • • Set B Set A Set A 3 Exercise 1. 1(c) 1. Given that $A = B = \{1, 2, 3, 4, 5, 6\}$ If $x \in A$ and $y \in B$, and the relation x "is a factor of" y Illustrate the relation by means of a Cartesian graph Given that $A = \{2, 4, 6\}$ and $B = \{1, 2, 3, 4, 5\}$ If $x \in A$ and $y \in B$, and the relation x "is double" y Illustrate the relation by means of a Cartesian graph Set B Set A Set B Set A

Homework : Textbook Exercise 1. 1. 1 page 3 1. 2 Identifying domain, codomain, object, image and range of a relation.

Domain is the set of x-coordinates of the set of points on a graph or the set of x-coordinates of a given set of ordered pairs. The value that is the input in a function or relation Range is the y-coordinates of the set of points on a graph, or the y-coordinates of a given set of ordered pairs. The range is the output in a function or a relation. A graph of a relation (a set of ordered pairs) is given below.

(Fig 1. 2) Note that the five points on the graph have the ordered pairs $\{(-2, 1), (3, 2), (4, 0), (2, -3), (-2, -3)\}$. The domain of this relation is the set $\{-2, 2, 3, 4\}$. Notice that although -2 is an x-coordinate twice, we need only list it in the domain once. The range of this relation is the set $\{-3, 0, 1, 2\}$.

Notice that although 3 is a y-coordinate twice, we need only list it in the range once. For the ordered pair $(-2, 1)$ the object is -2 and the image is 1 so the objects are $-2, 2, 3, 4$ and the images are $-3, 0, 1, 2$ FIG 1. (a) 1 • 3 •

5 • 7 • 9 • FIG 1. 2(b) • 2 • 4 • 6 • 8 • 10 4 Refer to figure 1. 2 (b) The codomain is the set { 2, 4, 6, 8, 10 } The domain is the set { 1, 3, 5, 7, 9, } The range is the set { 2, 4, 6, 8, } The images are 2, 4, 6, 8 The object s are 1, 3, 7, 9

Exercise 1.

2 Complete the table below based on the diagram given 1 2. -2 • 0 • 2 • 4 • • 0

• 4 • 8 • 10 • 16 Object Image Range Domain Ali • Bakar • Samy • • 84 • 90

Domain Codomain Codomain Object Image Range Homework : Textbook

Exercise 1. 1.. 2 page 4 1.

1. 3 Classifying a relation Example 3 Observe the table below and list the characteristic of each relation . Relations Arrow diagrams Ordered pairs

Graph y 7 One to one 2 4 6 3 5 7 {(2, 3),(4, 5), (6, 7)} 5 3 ? ? ? ? x 2 4 6 y One to many 6 5 1 3 4 5 6 {(1, 4),(3, 5), (3, 6)} 4 ? 1 ? ? 3 Many to one {(7, 6),(9, 6), (11, 14)} 7 9 11 6 10 14 14 10 6 ? ? ? 7 9 11 {(a, p),(b, p),(b, q),(c, s),(c, t)} Many to many a b c p q r s t t s ? ? r q ? p ? ? a b c 5 Exercise 1. 2

Complete the table below and determine the type of relations Bil 1 Arrow

diagram Ordered Pairs Graf Relation One to one -3 1 2 4 5 6 ? 9 4 1 -3 ? ? 1 2

2 {(-2, 1),(-2, 3) (0, 3)(1, 4),(3, 6)} -2 0 1 3 3 1 3 4 6 (a, 2),(b, 3) (c, 3),(d, 5)}

6 4 3? 1 -2 1 3 a b c d 2 3 5 5 ? ? ? ? a b c d 3 2 4 1 2 a b c d ? ? 1 ? ? 2 5 {(4,

2),(25, 5)} 4 25 36 2 5 5 2 ? ? 4 25 36 Homework : Textbook Exercise 1.

1.. 3 page 5 and Skill Practice 1. 2 page 6 6 2.

0 Learning Objective : Understand the concept of functions Learning

outcomes : Student will be able to 2. 1 Recognise functions as a special

relation 2. 2 Express functions using functions notation 2. 3 Determine

domain, object, image and range of a function 2. 4 Determine the image of a function given the object and vice versa. 2.

Recognising functions as a special relation Note: A special type of relations between two set A and B can exist when each and every members of A is related to one and only one member of B, although some of the member of B may not related to any member of A This type of relation is known as a function. It is important to realise that a function is a relation but a relation may or may not be a function . In other words, a function is a special type of relation Example 4 Determine which of these relations is a functions a) A B b) A B c) A B d) A B -2 0 1 3 1 3 4 6 7 9 11 6 10 14 a b c d Not a function No image for d 2 3 5 7 9 11 6 10 14 Not a function - 2 has two images A function because each member in A is related to member in B A function although 9 and 11 in A are both linked to 10 Exercice 2. 1 1) Determine which of this relations is a functions a) b) c) d) 1 3 4 5 6 7 9 11 6 10 14 a b c p q r s a b c d 2 3 5 Let's think Which type of relations ; one to one , one to many, many to one and many to many is a a function. Discuss it. Homework : Textbook Exercise 1.

2. 1 page 7 7 2. 2 Expressing function using function notation We have learnt that relations is also a function or mapping as each and every member of set A is linked to one and only one member of set B . Symbolically , we write $f : x \rightarrow x + 2$ which means that " the function f maps x onto " $x + 2$ ". In functional notation, we write $f(x) = x + 2$. $f(x)$ is read as ' function of x '.

The set of elements in A for the mapping is known as the domain while the set of images in B is known as the range . In functional notation, if $f(x) = x$

+ 2 and $x = 3$, then $f(3) = 3 + 2 = 5$ (3 is an object while 5 is the image)

Homework : Textbook Exercise 1. 2.. 2 page 8 2. 3 Determining domain, object, image and range of a function Example 5 Example 6 Bil 1 Functions

Functions notations $f : x \rightarrow x^2$ $f(x) = x^2$ times 2 " 1.

$2 \cdot 4 \cdot x \cdot 4 \cdot 8 \cdot 2x$ $f : x \rightarrow 2x$ $f(x) = 2x$ Object $x \rightarrow 2x$ 3^{-1} $a \rightarrow a+1$ $x^2 \rightarrow x^3$ $2x \rightarrow x^{-1}$

Images $f(x)$ $f(2) = 2(2) = 4$ $f(3) = 2(3) = 6$ $f(-1) = 2(-1) = -2$ $f(a) = 2(a) = 2a$

$f(a+1) = 2(a+1) = 2a + 2$ $f(x^2) = 2 \times 2$ $f(x^3) = 2 \times 3$ $f(x^2 - 1) = 2(x^2 - 1) =$

$2 \times 2 - 2$ $-2 \cdot -1 \cdot 0 \cdot 1 \cdot 2 \cdot 2 \cdot 0 \cdot 1 \cdot 4$ $f(-2) = 4$ $f(2) = 4$ $f(0) = 0$ $f : x \rightarrow 4x$ { (1,

4), (2, 8), (3, 12)} $3 \ 7 \ 5 \ 3 \ 1$ $p \ ? \ ? \ q \ ?$ $f(p) = 3$ $f(q) = 1$ $f(r) = 5$ r Exercise 2. 2

Complete the following table Functions a) $f : x \rightarrow 2x + 1$ x value -2 0 1 2

Calculations image $f(-2) = 2(-2)+1 = -3$ $f(0) = 2(0)+1 = 1$ $2x + 3$ b) $g : x \rightarrow 7 -$

$3 \ 5$ c) $h : x \rightarrow 4x - x^2$ -4 4 -2 8 2. Determining the image of a function given

the object and vice versa A Find the image for each of the following

functions. a) Given that $f(x) = 2x^2 - 4x + 5$, find the image For each of the following .

(i) $f(-1) = 2(-1)^2 - 4(-1) + 5 = 2+4+5 = 11$ ii) $f(2)$ b) Given that $f(x) = (x^2 -$

$2)^2 (x + 1) - 10$, find the image for each of the following. i) $f(0)$ ii) $f(2)$ 2 iii) $f()$

3 iv) $f(-4)$ v) $f(-1)$ vi) $f(-3)$ B . Find the object for each of the following

functions c) Given that $f(x) = 2x + 6$, find the object when the image is, d)

Given that $f(x) =$ the image is, (i) 2 ii) - 5 i) 5 ii) - 3 $2x + 8$, find the object

when 5 iii) 3 iv) ? 3 5 v) 8 9 ? 3 2 C. a) Given $h : x \rightarrow 3x-12$, Find i) the object

when the image is 6 ii) the object which mapped to it's self Solution : (i) (ii)

b) Given that $f(x) = 4 - 2x$, find the value m If $f(m) = 10$ Homework :

Textbook Exercise 1.

2. 4 page 10 9 D. (i) The diagrams below shows part of the mapping $f(x): x \rightarrow f(x)$: Find (i) the values of a and b (ii) the image of 3 under f (iii) the object whose image is -4 the values of a and b $x \rightarrow ax+b$ $4 \rightarrow ax + b$ Calculations the image of 3 under f the object whose image is -4 a) $7 \ 1 \ 8$ b) (ii) a) b) The diagram above shows part of the mapping $f(x) : ax + bx + c$. Find (a) $f(x)$. 2 (b) the image of -4 under f The diagram above shows part of the mapping 72 . Find $f: x \rightarrow ax + b$ (i) the values of a and b (ii) the image of 10 under f (iii) the object of 4 10 Example 6 a) A function f is defined by $f: x \rightarrow 12b, x \rightarrow ? ax + b$ a Given that $f(4) = -3$ and $f(10) = 6$, Calculate a) the value of a and b T b) the value of x for which $f(x) = -x$ b) A function f is defined by $f: x \rightarrow$ Given that $f(2)$ and $f(5) = -1$ a) state the value of k b) find the value a and b c) find $f(4)$ $a + b, x \rightarrow kx$ S Homework : Textbook skill Practice 1.

2 page 10 Absolute Valued Function Note : $(x) = x$ is called absolute valued function. The absolute value of a number is the distance the number is from zero on the number line. We write the absolute value of -2 as $|-2|$. The absolute value of a number is found by determining how many units the number is from zero. Since distance is always thought of as positive, the absolute value of any number is positive. For example, -2 is 2 units from zero, so $|-2| = 2$.

In the picture below, you can see that $|4| = 4$ and $|-4| = 4$, because both 4 and -4 are 4 units from zero on the number line. In equalities of a bsolute Valued Function (i) $x \rightarrow 3$ i) $f(x) \rightarrow 11$ Exercise 2. 4 a) Given that $f(x) = ? x^3 - 4$, find i) $f(3)$ ii) $f(-2)$ b) Given that $f \rightarrow ? 2x - 8$. Find the domain of the following functions i) $f(x) \rightarrow 2$ ii) $f(x) > 4$ T Example 11: Sketch the following function .

Hence, state the range that match with the domain given . b) $f: x > x - 3$ c))
 $f: x > x ? 2 + 1$ a) a) $f: x > x + 3 - 1 ? x ? 2 - 1 ? x ? 3 - 2 ? x ? 3$ 2. 5 Exercise
 Sketch the following function . Hence, state the range that match with the
 domain given .

a) $f: x > x ? 2$ for $-1 ? x ? 2$ b) $g: x > 2x + 1 - 2$ for $-1 ? x ? 2$ c) $h: x > 4 ? x$
 2 for $-1 ? x ? 3$ Homework 1. Sketch the graph of function $f: x ? 2x - 3 ?$ for $0 ?$
 $x ? 4$. Hence state the range that match with the domain given 2. .

Sketch the graph of function $> ? 2x - 5 ?$ for $0 ? x ? 6$. Find the value of x if
 $f(x) ? 4$. 12 $f(x) = ? 7 - 2x ?$ for $0 ? x$ range that match to the domain given.
 3. Given that $? 8$. find the 4.

A function f is defined by $f: x > ? 3x - 5 ?$ a) find $f(4)$, $f(10)$ and $f(-5)$ b) if $f(a)$
 $= 26$, find the possible value of a Learning Objective : Understand the
 concept of composite functions. Learning Outcomes : Student will be able to
 3. 1 Determine composition of two functions. 3.

Determine the image of composite functions given the object and vice versa.
 3. 3 Determine one of the functions when the composite function and the
 other function are given. 3.

0 Understanding the concept of composite functions. Note : 1. Composite
 functions is a function composed of two or more algebraic functions. 2.
 Functions can be combined to give a composite function.

If a function f is followed by a function g , we obtain the composite function g
 f . In general $gf ? fg$. f followed by g followed by h is denoted by hgf . The
 order is relevant and important. 3.

1 Determine composition of two functions. Example 3. Determining the composite functions. a) Two functions f and g are defined by $f : x \mapsto x - 2$ and $g : x \mapsto x^2 - 1$. Obtain expressions for fg , gf b) Two functions f and g are defined by $f : x \mapsto x^2 - x$ and $g : x \mapsto x^2 - 1$. Find $f \circ g$ and $g \circ f$ c) Two functions f and g are defined by $f : x \mapsto 5x - 2$ and $g : x \mapsto x^2 - 1$. Find $f \circ g$ and $g \circ f$ Exercise 3.

1.13 a) Two functions f and g are defined by $f : x \mapsto x^2 + 1$ and $g : x \mapsto x^2 + 6$. Find $f \circ g$ and $g \circ f$ b) Two functions f and g are defined by $f : x \mapsto x^2 + 6$ and $g : x \mapsto 3x + 4$. Find the values of x if $gf(x) = fg(x)$ c) Two functions f and g are defined by $f : x \mapsto x^2 + 1$ and $g : x \mapsto x^2 + 6$. Find $f \circ g$ and $g \circ f$ Homework :

Textbook Exercise 1.3.1 page 13 3.2 Determining the image of composite functions given the object and vice versa.

Example 3. Two functions f and g are defined by $f : x \mapsto x^2 + 1$ and $g : x \mapsto x^2 + 6$.

ii) Two functions f and g are defined by $f : x \mapsto 2x + 6$ and $g : x \mapsto ax + b$.

Given that $f \circ g(1) = 10$ and $g \circ f(2) = 8$. Calculate the values of a and b .

Find $f \circ g(2)$ and $g \circ f(4)$ c) Two functions f and g are defined by $f : x \mapsto x - 2$ and $g : x \mapsto x^2 - 1$. Obtain expressions for fg , gf , $f \circ f$ and $g \circ g$.

d) Two functions f and g are defined by $f : x \mapsto ax - b$ and $g : x \mapsto 2x - 5$.

Given that $f \circ g(1) = 10$ and $g \circ f(2) = 8$. Calculate the values of a and b .

Note : It is common to express $f \circ f(x)$ as $f^2(x)$, $f \circ f \circ f(x)$ as $f^3(x)$ etc.

Homework : Textbook Exercise 1.3.

2 page 14

Example 3.2(ii) The function g is defined by $g : x \mapsto \frac{1}{1+x}$. Express in their simplest forms each of the following functions a) $g^2(x)$ b) $g^3(x)$ c) $g^4(x)$ d) $g^{16}(x)$ Exercise 3.2(ii) The function g is defined by $f : x \mapsto \frac{1}{1+x}$.

Express in their simplest forms each of the following functions

5. Express in their simplest forms each of the following functions

c) $f_4(x)$ d) $f_{31}(x)$ a) $f_2(x)$ b) $f_3(x)$ 3.3 Determining one of the functions when the composite function and the other function are given .

Example 3.3 b) If $f(x) = x + 1$ find the function g such that 1 a) If $g(x) = (x ?)$ find the function f such that $g f(x) = x^2 + 2x + 12$ $g f(x) = 2x + 1$, 3 15

Exercise 3.3 a) If $f(x) = x + 4$ find the function g such that $2(x ? 1)$, $x ? 2$ $x ? 2$ $2(3 ? x)$ [Ans $g(x) : , x ? 2$] $x ? 2$ $f g(x) = b$ if $f(x) = x^2 + 1$ and $g f(x) = x^4 + 2x^2 + 9$. Find the function g .

[Ans $g(x) = x^2 + 8$] c) Given that $hg(x) = 2x + 1$ and $h(x) =$ function g . x . Find the 4 d) Given that $fg(x) = 5 - x$ and $f(x) = 8x + 3$. Find the function g
Homework : Textbook Exercise 1.3.

3 page 15 and Skill Practice 1.3 page 16. Learning objective 4.0 Understand the concept of inverse functions.

Learning outcomes : Student will be able to: 4. Find the object by inverse mapping given its image and function. 4.2 Determine inverse functions using algebra. 4.

3 Determine and state the condition for existence of an inverse function. 4.0 Understanding the concept of inverse functions. Suppose f is a function “ multiply by 3” .

If. this function is applied to x , then the images of x is $3x$ What function should we apply to $3x$ in order to get back to x ?. This function which maps the image back to its initial value is known as the inverse function of f , and it is denoted by f^{-1} . Symbolically we write $f(x) = 3x$ and $f^{-1}(3x) = x$ if f is

a many - to - one function, then its inverse is not a function but a one- to-many relation.

Only one - to - one functions will give one - to - one inverse functions. 16 4.

1 Finding the object by inverse mapping given its image and function. $f = x - 1$

$f(3) = 2$ $f(4) = 3$ $f(5) = 4$ $f^{-1}(2) = 3$ $f^{-1}(3) = 4$ $f^{-1}(4) = 5$ $f^{-1}(5) = 6$ Example 4. 1

Find the value of a and b in the following diagram by the inverse mapping a)

$f : x \rightarrow 4x - 5$ $f^{-1}(13) = 8$ $f^{-1}(1) = b$ b) $f : x \rightarrow ax + 5$ $f^{-1}(3) = a$ $f^{-1}(b) = -3$ $f^{-1}(13) = 17$ $f^{-1}(7) = 4$ $f^{-1}(b) = 1$

Exercise 4.

1 a) $f : x \rightarrow 2x$ $f^{-1}(x) = \frac{x}{2}$ b) $f : x \rightarrow ax + 1$ $f^{-1}(3) = 9$ $f^{-1}(17) = 3$ $f^{-1}(a) = b$ $f^{-1}(-1) = 1$ $f^{-1}(8) = 4$ $f^{-1}(b) = 1$

1 • 1 • Homework : Textbook Exercise 1. 4. 1 page 17 17 4. 2 Determining

inverse functions using algebra Example 4. 2 (i) a) Find the inverse function

for the function $f : x \rightarrow 3x + 4$ then find $f^{-1}(2)$? 1 b) Given $f : x \rightarrow 3x + 1$, $x \rightarrow$

2.

Find $f^{-1}(x)$, $x \rightarrow 2$ and $f^{-1}(4)$, $f^{-1}(2)$ 1 $f^{-1}(\)$ 3 Exercise 4. 2 a) Given

$h : x \rightarrow 3x$, find $h^{-1}(x)$, $h^{-1}(3)$ b) Given that $f : x \rightarrow hx + k$,

$x \rightarrow 2$ and its inverse function $f^{-1} : x \rightarrow 2x - 9$, $x \rightarrow 4$. Find the

value of $x \rightarrow 4$ h and k. Homework : Textbook Exercise 1.

4. 2 page 18 18 a) A function f is defined by $f : x \rightarrow x + 3$. Find (i) $f^{-1}(2)$ (ii) the

function g such that $gf : x \rightarrow x + 6x + 2$. (i) f^{-1} (ii) function g ? 1 Example 4.

2(i) : b) A function f is defined by $f : x \rightarrow x + 2$. Find the function g such that

$gf : x \rightarrow x + 9$ A function f is defined by $f : x \rightarrow 2x - 1$.

. Find i) $f \circ g : x > 7 - 6x$ the function g such that 5 ii) $g \circ f : x > 2x + 4$. 3

Determining and stating the condition for existence of an inverse function. .

(a) (b) Diagram (a) shows function $g(x) = x^2$, which is not a one to one function. Reversing the arrows, you do not have a one to one function.. In general, for a function f to have an inverse function, f must be a one to one function. Note : If f is a many - to - one function, then its inverse is not a function but a one - to - many relation. Only one - to - one function will give one- to-one functions Remember : IF A FUNCTION F IS ONE TO ONE, THEN THE INVERSE FUNCTION f^{-1} DOES EXIST !!!!! 19 Example 4.

3 Determine whether the inverse of the following function is a function or not

. a) $f(x) = (x+1)^2$ 1 b) $g(x) = \sqrt{x}$, $x \geq 0$ x Exercise 4. 3 : Determine whether the inverse of the following function is a function or not a) $f(x) = 3 + 8x$, $x \geq 0$ x x^2 b) $g(x) = 4$ Homework : Textbook Exercise 1. 4.

3 page 20 and Skill Practice 1. 4 SPM Questions $P = \{1, 2, 3\}$ $Q = \{2, 4, 6, 8, 10\}$ SPM 2003 Paper 1 Based on the above information, the relation between P and Q is defined by the set of ordered pair $\{(1, 2), (1, 4), (2, 6), (2, 8)\}$

State (a) the image of 1, (b) the object of 2 [2 m] 2. Given that $g : x > 5x + 1$ and $h : x > x^2 + 3$, find 2 (a) $g(3)$? 1 (b) $hg(x)$ [4m] [ans a) 2, 4 b) 1 2. a) $2/5$ b) $25x^2 + 2$ 20 SPM 2004 1. Diagram 1 shows the relation between set P and set Q . • w d • e • f • • x • y • z State (a) the range of the relation (b) the type of the relation.

[2 m 2. Given the functions $h : x > 4x + m$ and $h^{-1} : x > 2kx + 5$, where m and k are constants, find the value of m and of k [3 m] 3. Given the function $h(x) = h(x)$ and the composite function $hg(x) = 3x$, find a)

$g(x)$ b) the value of x when $g \circ h(x) = 5$ [4 m] 1a) x, y b) many to one . 2 (a) $m = -5/2, k = 1/8$ 3 (a) $g(x) = 2/x$ (b) $x = 15$ 2005 x, y, z 8 2 5 In diagram, the function h maps x to y and the function g maps y to z Determine (a) $h^{-1}(5)$ (b) $g \circ h(2)$ [ans (a) 2 , b) 8] 2.

The function w is defined as $w(x) = (a) w^{-1}(x) 5, x \geq 2$ Find $w^{-1}(4)$ [3 mark] 3. The following information refers to the function h and g $h(x) : x > 2, x \geq 3 - 1$ $g : x > 4, x \geq 1$ Find gh 21