

3F1

# Test 2 notes

## Module 3: Functions

Ann: - Retake exam in Nov.

↳ only 1 exam, second score counts.  
- results for exam 1 open sept 13<sup>th</sup>.

↳ only can open once!  
- post exam reflection in BB  
Spanish,

- KC 2 opens Monday of week 5.

{ IKC adds to HW.

{ can lower HW score  
that like IKC.

(P)review: 1) Which are functions of  $x$ ?

a) write  $x = \frac{a}{b}$ ;  $f(x) = 6$ .

no,  $\frac{a}{b} = \frac{2a}{2b}$  but  $f(\frac{a}{b}) = 6 \neq f(\frac{2a}{2b}) = 2b$

b)  $x^2 + y^2 = 4^2$

no,  $(-2, 0), (2, 0) \in \text{Graph}(x^2 + y^2 = 4^2)$

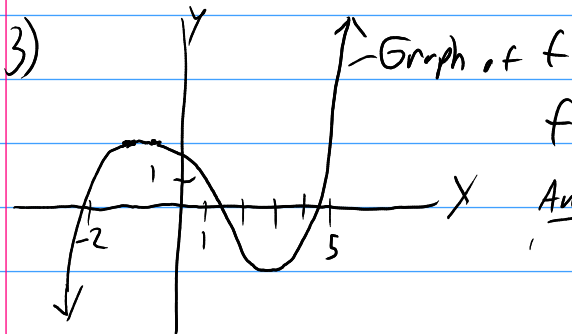
fails vert line test.

3F2

$$2) g(x) = -4x^2 + 5$$

$$f(z) = z - 2$$

find  $(g \circ f)(y)$



find  $f^{-1}(1)$

Ans!  $f^{-1}(1) = \{x \in \mathbb{R} : f(x) = 1\}$   
 $f^{-1}(1) = \{-2, 1, 5\}$

## Content: Functions

Def: A set of ordered pairs  $(x, y) \in R \subseteq X \times Y$  is called a relation of  $X$  and  $Y$ .  
 say  $xRy$  if  $(x, y) \in R$ .

ex)  $\{(1, 2), (3, 2), (3, 1)\} \subseteq \mathbb{Z} \times \mathbb{Z}$

ex) ordered pairs on a graph

ex)

x	y
1	2
1	3
2	2

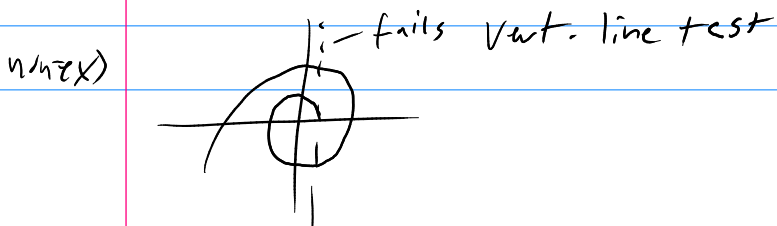
Def: A function is a relation  $F$  such that each input has only one output.  
 — "vertical line test"

Notation:

$f: A \rightarrow B$   
 domain  $A$  codomain  $B$   
 function name  $f$   
 $a \mapsto \text{expr}(a)$   
 rule  
 or  $f(a) = \text{expr}(a)$   
 and domain, codomain implicit or stated

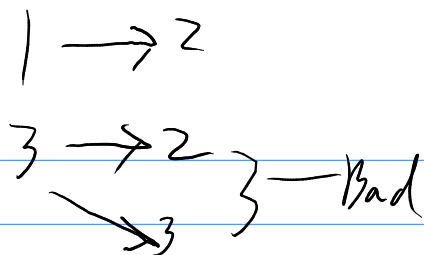
ex)  $f: \mathbb{R} \rightarrow \mathbb{R}$  or  $f(r) = 3r + 1$   
 $r \mapsto 3r + 1$

non-ex)  $f\left(\frac{a}{b}\right) = a$ ; note  $\frac{a}{b} = \frac{3a}{3b}$  yet  
 $f\left(\frac{3a}{3b}\right) = 3a$ .



non-ex)  $\{(1, 2), (3, 2), (1, 2), (3, 3)\}$

3F4



Def: The range of  $f: A \rightarrow B$  is  
 $f(A) = \{f(a) : a \in A\}$   
 $= \{b \in B : \underset{\text{exists}}{\exists} a \in A \text{ w/ } f(a) = b\}$   
"achieved elements in codomain".

BB-M3 <sup>notes</sup> class do bot of p1, but of p2

Telling if equation is function:  
 $\text{expr}_1(x, y) = \text{expr}_2(x, y)$  is a  
function of  $x$  if you can isolate  
 $y$  uniquely.

non-ex)  $y^2 - x = 4$   
 $y^2 = 4 + x$   
 $y = \pm \sqrt{4+x}$  not unique ans per  $x$ .

3F5

non-ex)

$$|y| + x = 3$$

in out

test: set  $x=0$ 

$$|y| + 0 = 3$$

$$y = \pm 3$$

$$\begin{array}{l} 0 \rightarrow 3 \\ \quad \rightarrow -3 \end{array}$$

not func.

caution!

ex)

$$y^2 + 3x = 2(x-4) + x + 8$$

$$y^2 + 3x = 2x - 8 + x + 8$$

$$y^2 + 3x = 3x$$

$$y^2 = 0$$

$$y = 0$$

BB M3 notes p3 top.

