Math 321

Study For Final

1. Fix Exam 1 and do variations of each problem.
2. Don't know how to do a problem... See me.

Q's

2.1(25) $\{\text{airlines}\} \times \{\text{cities}\} \times \{\text{cities}\}$

$= \{ (a,b,c) \mid a \text{ is an airline} \wedge b \text{ is a city} \wedge c \text{ is city} \}$

Exam 1 (b) $\square \rightarrow \triangle$

this suf. this is nec.

b: bad breath $\quad \neg b \rightarrow c$

c: eat cheese

Sets: unordered collection of stuff.

$A = B$ iff $\forall x (x \in A \leftrightarrow x \in B)$

$A \subseteq B$ iff $\forall x (x \in A \rightarrow x \in B)$

etc

2.3 Functions.

① Associations (n-ary Relations)

S: Set of Students
C: Set of chairs
B: Set of books
P: Set of phones

Rule that takes the ordered n-tuple (student, chair, book(s), phone)

② Relation (talk about only two sets)

③ Functions: a function assigns to each element in A exactly one element in B.

Notation: $f: A \to B$ (A, B are non-empty)

$f(a) = b$

$A \equiv$ domain

$B \equiv$ Codomain

$\text{Range} = \{ b \mid \forall a \, (f(a) = b) \}$

$a \equiv$ pre-image
$b \equiv$ image

Given two functions f and g when are they equal.

(ex) $f(x) = \dfrac{x^2-4}{x+2}$ $\quad f: \mathbb{R} - \{-2\} \to \mathbb{R}$

$f(x) = \dfrac{(x+2)(x-2)}{(x+2)} = x-2$

equal!

$g(x) = x-2, \quad x \neq -2$

$f = g$ if same domain, range and same mappings.

Other ops: $f: A \to \mathbb{R}$ $\quad g: A \to \mathbb{R}$

$f+g : (f+g)(x) = f(x)+g(x)$

$fg : (fg)(x) = f(x)g(x)$

$D_x[f(x)] =$

$I_x[f(x)] =$

Types ① f is one-to-one iff

$\forall a \forall b \, (f(a) = f(b) \rightarrow a = b)$

② f is onto iff

$\forall y \exists x \, (f(x) = y)$

(all codomain is the range)

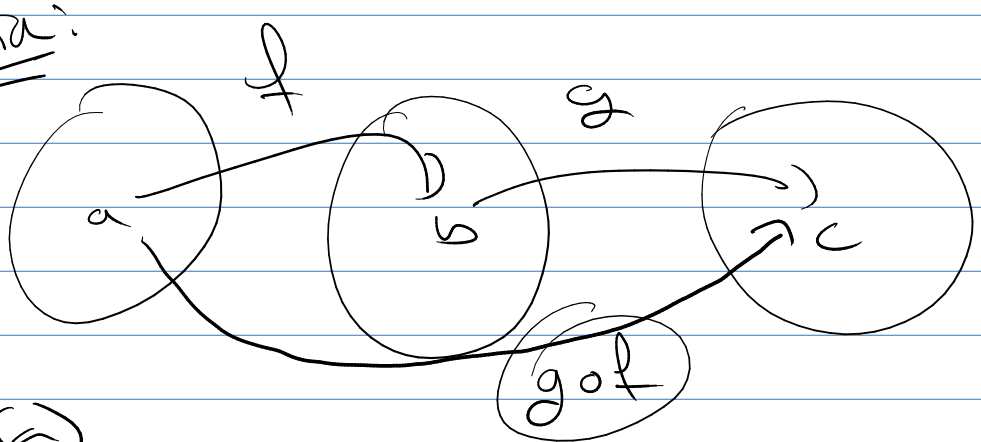
③ f is a bijection if it is one-to-one and onto.

Inverses / Identities

Additive: $a + 0 = a$ (0: add. identity)

$a + (-a) = 0$ ($-a$: add. inverse)

Composition:



$b = f(a)$

$c = g(b) = g(f(a))$

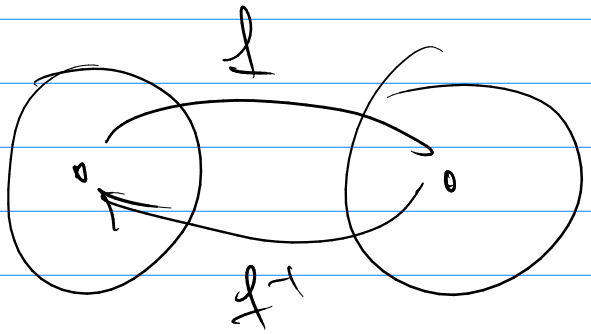
Identity function (composition)

$$I(x) = x$$

Inverse function:

$$(f \circ f^{-1})(x) = x$$

$$(f^{-1} \circ f)(x) = x$$



to find f^{-1} f must be a bijection.