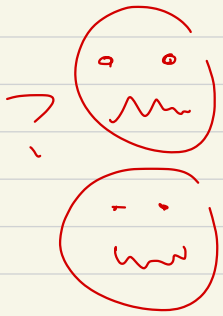
CPSC 421/501, Sept 23, 2021

- We will return to more facts about countability, etc. when we discuss §4.2 of [Sip]. For now:

  - Appendix A of Handout

    Alphabets, Strings, etc.

    (Chapter 0 of [Sipser])



  - Appendix B of Handout

    B.1: Injections, ... (Ch 0 [Sip])

B.2 : Countable Sets

§4.2 Section 4.2 [S:p]

B.3 : Cantor's Theorem

TODAY!

=

I have learned.

(1 syllable)

We are learned.

(2 syllables)

Countability:

- Finite sets — Appendix A, B — Ch. 8 [Sip]

- Countably Infinite

e.g.

$\mathbb{N} = \{1, 2, 3, \ldots\}$

$ASCII^* =$ as set

$\{a\}^* = \{\varepsilon, a, a^2, \ldots\}$

} all the same size

Problem 8.3.5

Johnny

Mara

Alexis

David

$S, |S| = 3$

$S = \{$ Prof. Hummus

Prof. ~~s~~ Humus,

Prof. Pita,

Prof. Halva

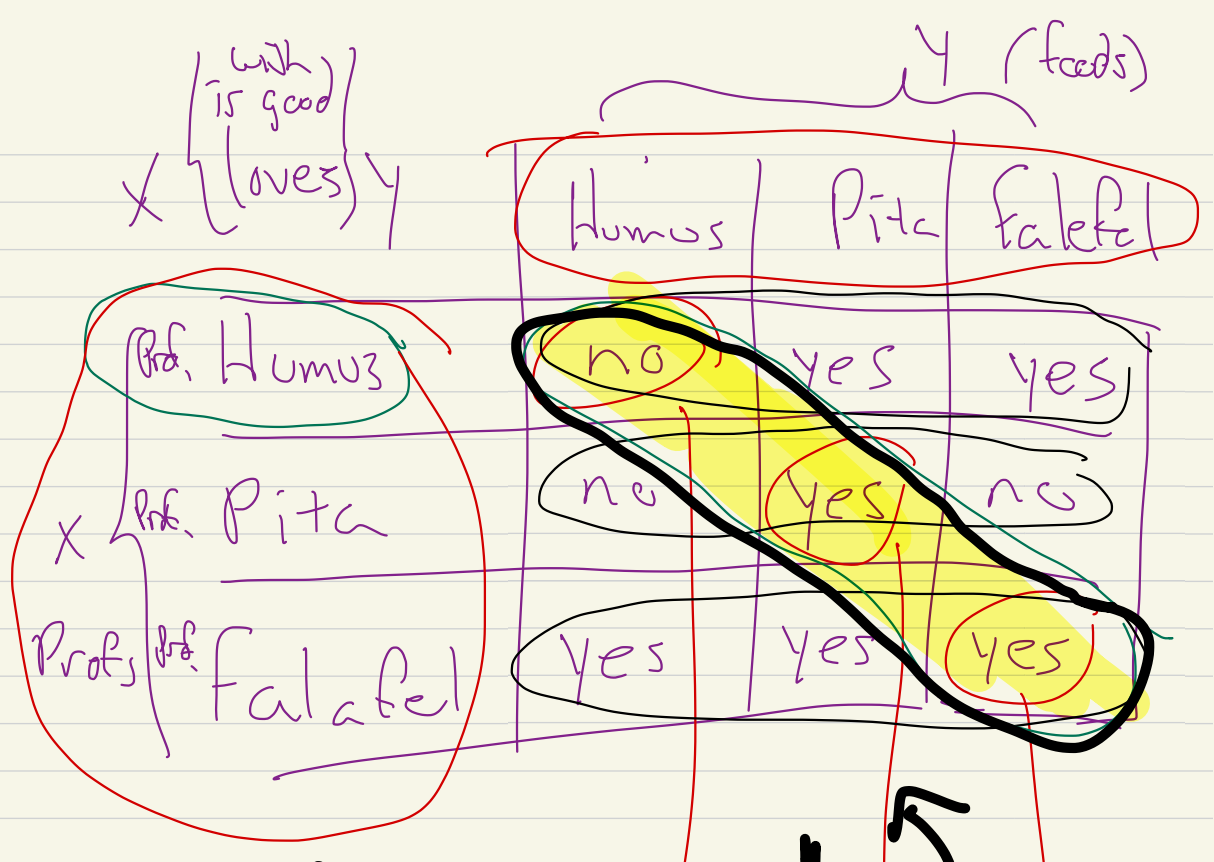


TABLE 15

Binary relation

yes no no

$T = \{ \text{humus}, \quad , \quad \}$

P = profs pigeons programs	I = ice creams inputs

$P = I$ (often S for set)

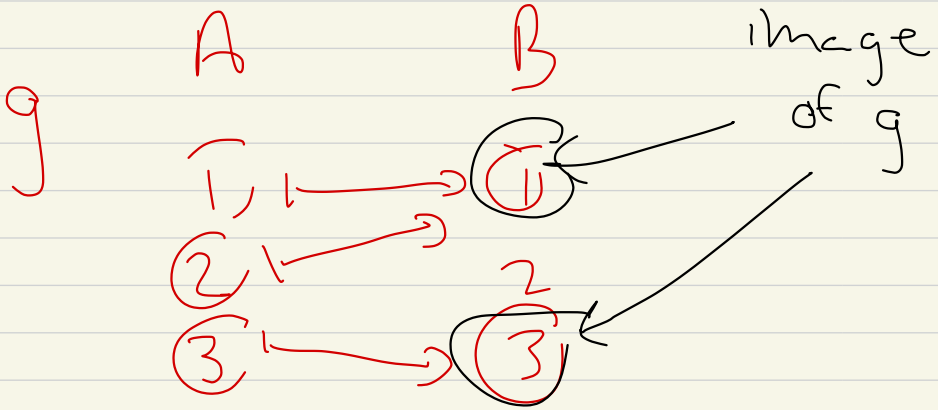
Cantor's Thm:

Let $f : S \to \text{Power}(S)$. Then

$$T = \{ t \in S \mid t \notin f(t) \}$$

Then T is not in the image of f.

If $g: A \to B$ is a map of sets, then the image of g



Prof Humus loves

{ , pita, falefel }

T ≠ Prof Humus loves

{ humus, ... } { ac humus, ... }

=

S → Power(S) |S| = 3

size 3 size $2^3 = 8$

5 minute break

10:56 – 10:11

$f : S \longrightarrow Pow(S)$

Prof Humus $\longmapsto$ { , Pita, Falafel }

Prof Pita $\longmapsto$ { , Pita, }

Prof Falafel $\longmapsto$ { Humus, Pita, Falafel }

$S = \{ Humus, Pita, Falafel \}$

Not so important

Why diagonal?

Generating an equivalent table:

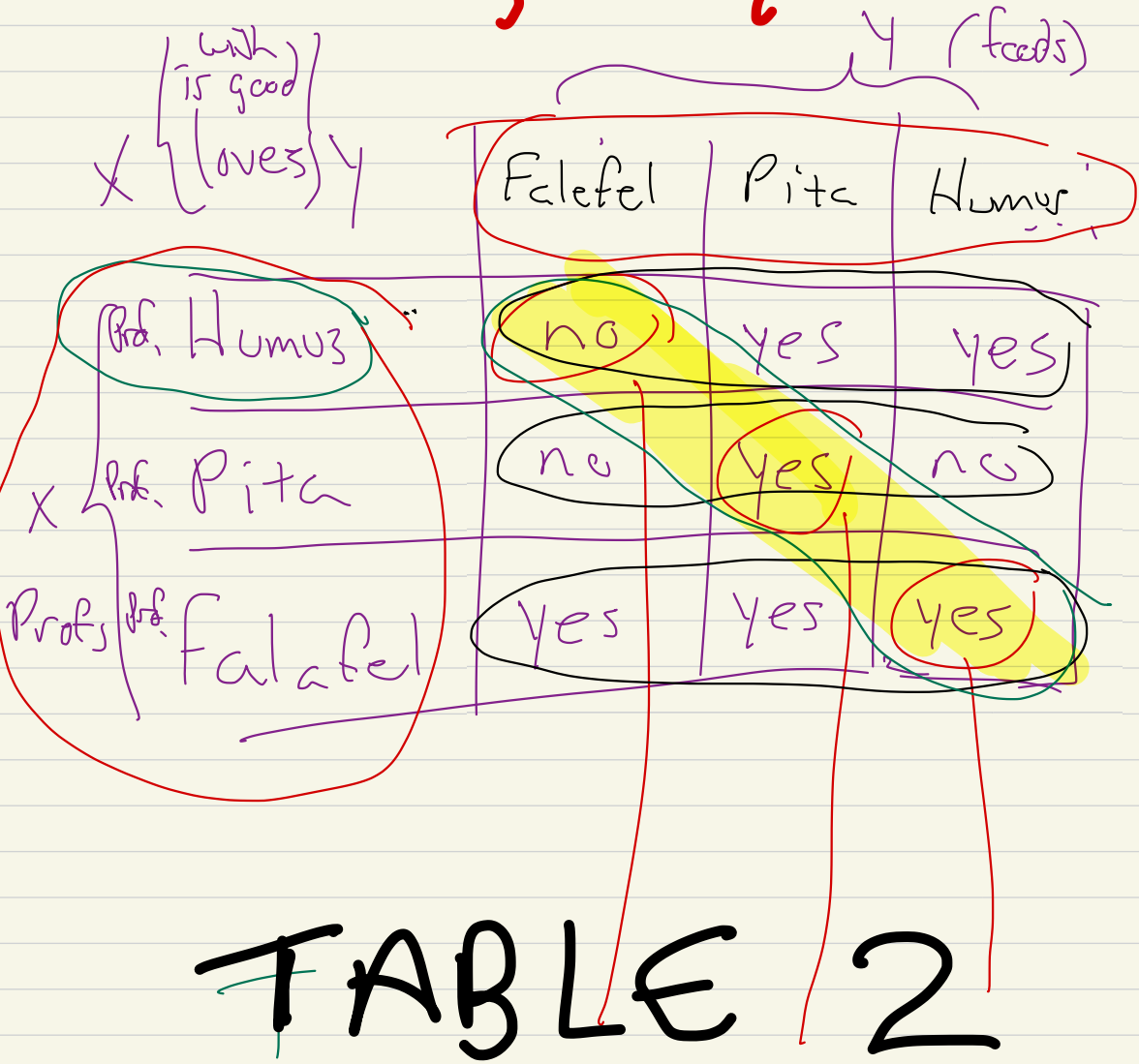


TABLE 2

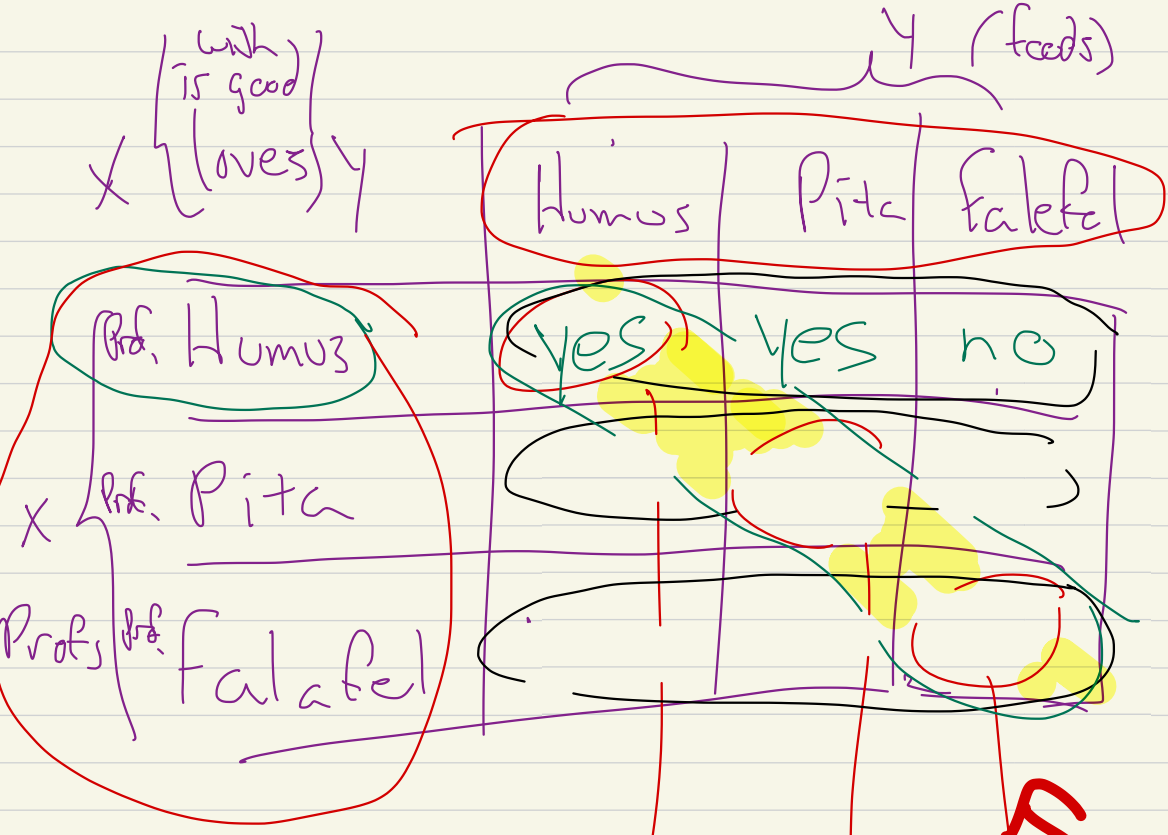


TABLE 2'

Original Names

A new example via renaming

TABLE 1

H	P	F
no	yes	yes

H

P

F

How to use off diagonals to produce something not in the image

$H \mapsto \{P, F\}$

$T = \{\ ,\ ,\ \}$

P

[Nice homework problem for 2021 or later. All one needs is a permutation

$$\pi : S \xrightarrow{\text{perm}} S$$

$$f : S \to \text{Power}(S)$$

$$\pi : S \to S \quad \text{permutation}$$

$$T = \{ t \in S \mid t \notin \pi^* f(t) \}$$

$\pi^* f$ (maybe $\pi_* f$?)

$\pi^* : \text{Power}(S) \to \text{Power}(S)$

should be enough

How many people (maybe excluding prof) are there?

Number between

~~1~~ 28 – 31

that is your birthday date (not) month

Med 10

2. special people

4 + 9

+ 5

= 18

How many with

7 ? = 4

2 ? = 4

stop

roughly 40