Today:

2.3 Valid & Invalid Arguments

Last time:

- 2.1 Logical Form & Equivalence
- 2.2 Conditional Statements
- 2.3 Valid & Invalid Arguments

D C&D approach but only C speaks.

C somes: Both of us are knowns.

What are C&D?

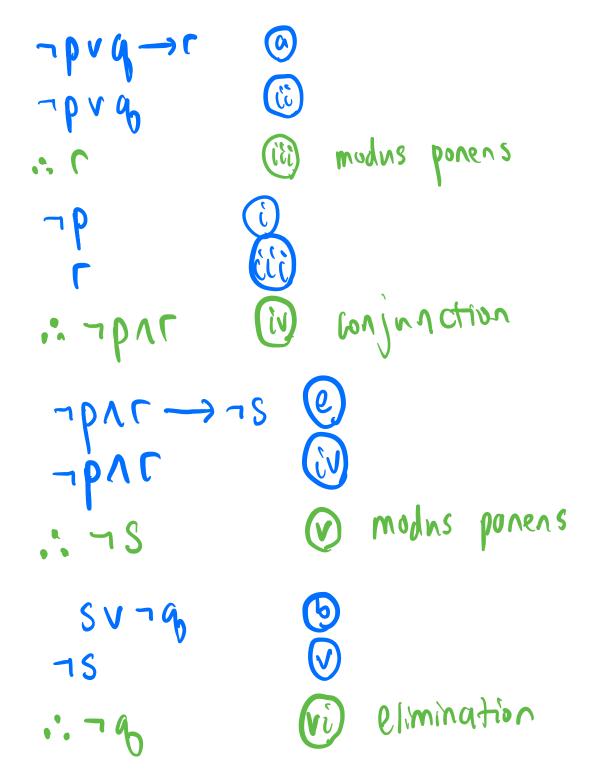
O Suppose C is telling the truth. assumption ② C&D are knaves. what C said ③ C is a knave. specialization 3 C is a known.

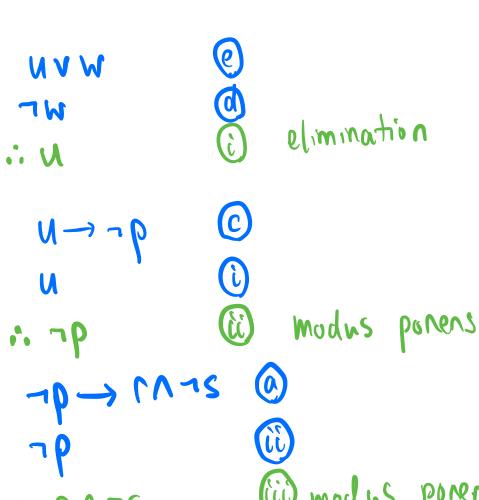
by def. of known by def. LO C is felling the truth but lying wajunction 6 C is lying. contradiction rule 1) C is a known. by def. of known (3) Not both C&D are knaves. regation of what 9 C is a knight or D is a lonight. DeMorgan's laws (10) Since C is a knove, D is a knight. elimination

- (pv-p)
- (pv-p)
- (pv-p)

Modus Ponens P - 4 P 4	Elimination Opva No No No No No No No No No N
Modus Tollers P - 9 ~ 9 ~ P	Transitivity
Generalization © p © 9 i p v 9 Specialization	Proof by Cases Proof by Contradiction ~p→ L ∴ p
@phq @phq i.p Conjunction p q phq	

A set of premises and a conclusion are given. Use the valid argument forms listed in Table 2.3.1 to deduce the conclusion from the premises, giving a reason for each step as in Example 2.3.8. Assume all variables are statement variables.







t-s 75 ···nt





3.1 Predicates & Quantifiers I

```
Some important sets:
$ or {} empty set
             natural numbers {1,2,3,...3 or {0,1,2,...}
             mtegers {0,1,-1,2,-2,3,-3,...}
             negative integers {-1,-2,-3,...3
             positive integers {1,2,3,...}
              nonnegative integers {0,1,2,...}
Znonney
              rational numbers { m, ne Z; n + 0}
Q,
              negotive rational numbers { c= Q: c < 0}
Q 
              positive antonal numbers {cea: r>0}
           nonnegative autonal numbers {rea: r>03
Chooning
              real numbers
 R
              regative real numbers
 Rt
             positive real numbers
 Rooning
              nonnegative real numbers
         complex numbers {a+bi:a,ber; i=5-1}
 H
              quaternions
```

some set theory and operations Suppose A,B are sets. a is an element of A aeA a is not an element of A a & A set with elements a,,..., an {a,...,a, } A complement A is a subset of B ACB or ACB A is not a subset B A¢B or A⊈B A equals B A = BA union B AUB A intersect B AnB set difference A minus B A-B ordered pair (x, y)ordered n-tuple (x_1, x_2, \dots, x_n) Cartesian product of A&B AxB Cartesian product of sets A,,..., An $A_1 \times \cdots \times A_n$ power set of A **P(A)** A= {1,23 22 = 4 op(A) = 80, 813, 923, 81,233

A x B = {(a,b): a E A and b E B }

P -> 9 = -> P v 9

Theorem *

(formerly "Avresome law" in Spring 2021)