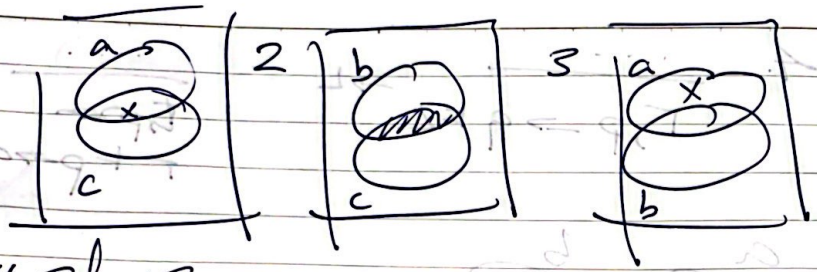
1. 

2

3

~~All~~ ~~some~~ ~~a~~ ~~is~~ ~~in~~ ~~but~~ ~~only~~ some a is in c, so ~~there~~ can be some a in c

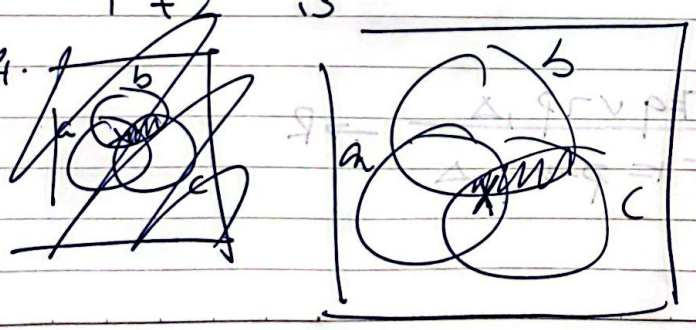
$a \not\vdash \neg c \quad b \vdash c$

$a \not\vdash b$

~~some a is not in b~~

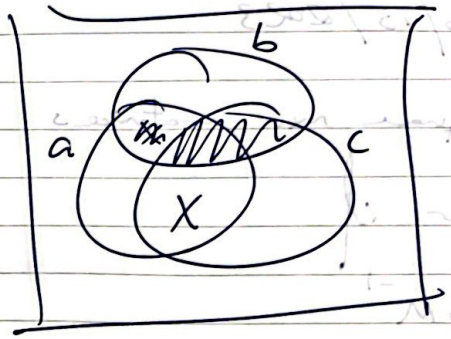
~~$a \not\vdash \neg c \quad b \vdash c \quad a \not\vdash b$~~

So 1 + 2 is

4. 

PULL OPEN

4 + 3 is



So if b entails c and there is some a that's in c and some a that's not b, it concludes that there ~~can be~~ is some a that is in c but not b.

PULL OPEN

~~$C \nvdash \neg a$~~

1. $a \nvdash \neg c$ ~~$b \vdash c$~~ ~~$c \vdash B$~~

$a \vdash b$

$a \nvdash b$

~~$\exists x \, Cx$~~

There is some x in a that is not part of b ~~$\exists x \, Cx$~~. Doesn't entail all a is not b.

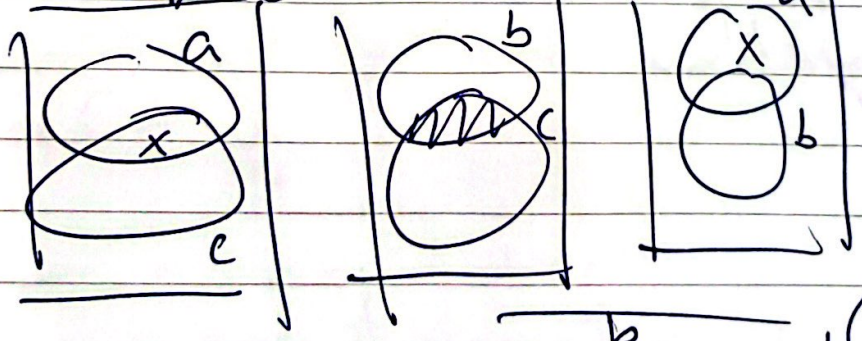
~~$C \vdash B$~~ ~~A~~

~~$c \vdash b$~~ ~~$\exists x \, Cx$~~

$a \nvdash \neg c \quad c \vdash b$

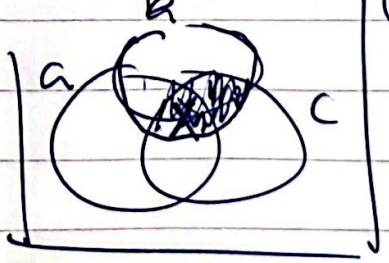
$a \nvdash \neg b$

1. ~~$a \nvdash b$~~ 2. 3



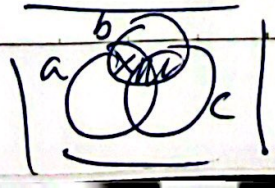
(x is in center)

1 ∝ 2 → 4



4 + 3

→



2. $\dfrac{a \vDash b \quad b \vDash c}{a \vDash c}$

$\dfrac{a \vDash b \quad a \vDash c}{b \vDash c}$

* contraposition
* Replacement
* Predicates
* Double negation

~~Contraposition~~

Substitute $? \dashv\vdash a$ $\dashv\vdash \neg a$

$\dfrac{\neg a \vDash b \quad \neg a \vDash c}{b \vDash c}$

double negation x 2

$\dfrac{a \vDash \neg b \quad \neg a \vDash c \quad a \vDash \neg c}{b \vDash c}$

Contrapose Barbara (sequent)

$\dfrac{a \vDash \neg b \quad a \nvDash \neg c}{b \nvDash c}$

Contraposition + double negation

$\dfrac{a \vDash \neg b \quad a \nvDash \neg c}{c \nvDash b}$

3. $(p \wedge q) \vee \neg p \vee \neg q$

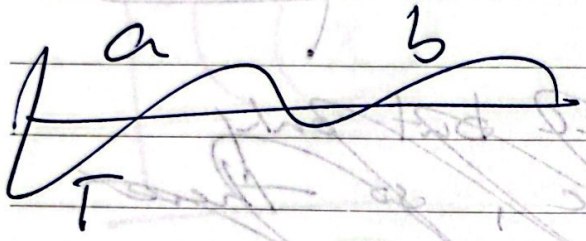
I guess you can

$$\dfrac{\dfrac{}{(p \vdash p, q)}\,I \qquad \dfrac{}{(p, q \vdash p, q)}\,I}{p, q \vdash p, q}$$

$$\dfrac{\dfrac{\dfrac{\dfrac{}{p, q \vdash p, q}\ \text{immediate}}{p, q \vdash p \wedge q}\,\wedge R}{\vdash (p \wedge q), \neg p, \neg q}\,\neg R, \neg R}{\vdash (p \wedge q) \vee \neg p \vee \neg q}\,\vee R, \vee R$$

4. $\dfrac{\cdots}{\Gamma, p \to q \vdash \Delta}\ \to L$ $\qquad$ $\dfrac{\cdots}{\Gamma, p \vdash q, \Delta}\ \to R$

$\Gamma \vdash p \to q, \Delta$



$p \to q \equiv \neg p \vee q$

$\dfrac{}{\Gamma \vdash \Delta, \neg p \vee q \vdash \Delta}\ I$

$\dfrac{\Gamma, \neg p \vee q \vdash \Delta}{\Gamma, p \to q \vdash \Delta}\ \to L$

$\dfrac{\Gamma, q \vee \neg p \vdash \Delta}{\Gamma, p \to q \vdash \Delta}\ \to L$

$\dfrac{\Gamma \vdash q \vee \neg p, \Delta}{\Gamma \vdash p \to q, \Delta}\ \to R$

PULL OPEN