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1. i) the left hand side:

the right hand side:

(poq) v (qop) = (7pvq) v (7qvp)

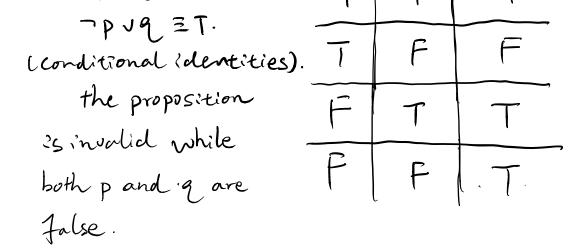
2. 1) Valid.

Disjunctive Syllgism

2) Invalid.

it is invalid.

3) Invalid.



- $3i) \propto$ , z are free variables y is bound variable.
  - ii) There's a prime number P there exist no integer k satisty p=2ktl.
  - iii) Tes. It is true become when P=2, there's no integer satisfy p=2k+1.
- 4. A: There are some trees always shed their leaves.

B: There are some trees always change color.

c: There are some trees shorter than 25 m.

37. (Domination Laws).

5.) direct proof:

3BUT

$$n = \frac{x+y+z}{3}$$
.

assume that  $z$  is the least one of the number.

 $n - 2 = \frac{x+y-2z}{3} = \frac{(x-z)+(y-z)}{3}$ .

 $= \frac{x+y-2z}{3} = \frac{(x-z)+(y-z)}{3}$ .

 $= \frac{(x-z)+(y-z)}{3}$   $= \frac{x+z-2}{3}$ .

 $= \frac{(x-z)+(y-z)}{3}$   $= \frac{x+z-2}{3}$ .

ii) proof by contradiction.

assume atble is rational.

given that a is rational number, biz should also be a rational number.

however, b is a rational number 52 is an irrational number. So 55 can't be a rational number.

2. at bb is irrational.

6. the contraposition-

x is odd if x2+3x+5 is odd.

it is odd, x2 is odd,

3x is odd.

5 is an odd number.

x2+3x+5 is an odd number.