

①  $A \text{ or } \sim A$  and  $(B \text{ or false}) = B$

$= A \text{ or } \sim A$  and  $B$   $\quad [B \text{ or false} = B]$

$= \text{true and } B$   $\quad [\sim A \text{ or } A = \text{true}]$

$= B$   $\quad [\text{true and } B = B]$

~~$A \text{ or } \sim A$~~   ~~$B$~~

$A \text{ or } \sim A$  and  $B$   $\quad [\text{and has higher precedence than or}]$

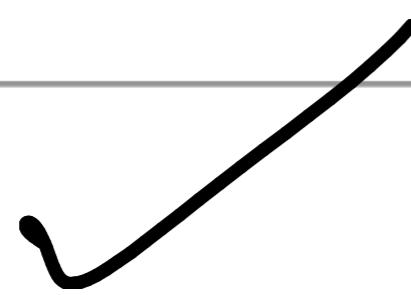
$= A \text{ or } (\sim A \text{ and } B)$

$= (A \text{ or } \sim A) \text{ and } (A \text{ or } B)$   $\quad [\text{distributive property}]$

$= T \text{ and } (A \text{ or } B)$

$= A \text{ or } B$

②  $(A \text{ and } B) \text{ or } (A \text{ and } \sim B) = A$   
 $\vdash A \text{ and } (B \text{ or } \sim B)$  [distributive property]  
 $\vdash A \text{ and true}$  [ $B \text{ or } \sim B = \text{true}$ ]  
 $\vdash A$  [ $A \text{ and true} = A$ ]



$$(3) A \text{ or } (\text{false and } B) = A$$

$$= A \text{ or false} \quad [\text{false and } B = \text{false}]$$

$$= A \quad [A \text{ or false} = A]$$

✓

- (4)  $(A \text{ and } B) \text{ or } NA \text{ or } (A \text{ and } NB) = \text{true}$
- $\equiv (A \text{ and } B) \text{ or } (A \text{ and } NB) \text{ or } NA$  [commutative]
- $\equiv A \text{ and } (B \text{ or } NB) \text{ or } NA$  [and distributive]
- $\equiv A \text{ and true or } NA$  [B or NB=true]
- $\equiv A \text{ or } NA$  [A and true=A]
- $\equiv \text{true}$  [A or NA=true]

✓

$$A \text{ and } T \Leftrightarrow \neg A$$
$$\equiv (A \text{ and } T) \text{ or } \neg A$$

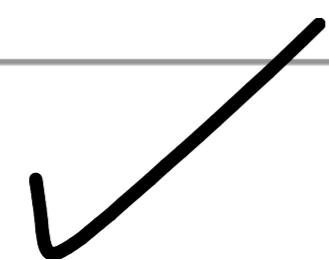
⑤

$$A \text{ and } \neg(A \text{ or } B)$$

$$\equiv A \text{ and } \neg A \text{ and } \neg B \quad [A \text{ and } \neg A = \text{False}]$$

$$\equiv \text{False} \text{ and } \neg B \quad [\text{False and } \neg B = \text{False}]$$

$$\equiv \text{False}$$



⑥  $(A \text{ or } B) \text{ and } (\text{not } A \text{ or } B) = \text{False}$

$\equiv \text{false}$

~~$\neq$~~

$[(A \text{ or } B) \text{ and } (\text{not } A \text{ or } B) = \text{false}]$

~~$\quad \quad \quad$~~

$= (A \text{ and } \neg A) \text{ or } B$

$= F \text{ or } B$

$= B$

⑦  $(A \text{ and } B \text{ and } c) \text{ or } (A \text{ and } B \text{ and } \sim c)$

$= A \text{ and } B \text{ and } (c \text{ } \overset{\text{or}}{\underset{\text{and}}{\sim c}}) \text{ [distributive]}$

$= A \text{ and } B \text{ and } \underline{\text{False}} \text{ [ } c \text{ and } \sim c = \text{False} \text{ ]}$

$= A \text{ and } \underline{\text{False}} \text{ [ } B \text{ and } \text{False} = \text{False} \text{ ]}$

$= \underline{\text{False}} \text{ [ } A \text{ and } \text{False} = \text{False} \text{ ]}$

$A \text{ and } B \text{ and } (c \text{ or } \sim c)$

$= A \text{ and } B \text{ and } T$

$= A \text{ and } B$

⑧  $A \text{ or } (B \text{ and } \neg A) \equiv A \text{ or } B$   
 $\equiv (\neg A \text{ or } B) \text{ and } (A \text{ or } \neg A)$  [distributive]  
 $\equiv (A \text{ or } B) \text{ and true}$  [And not A = true]  
 $\equiv A \text{ or } B$  [B and true = B]

