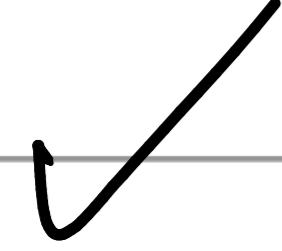


① $(A \text{ and True}) \text{ or } (B \text{ and False}) = A$
= $A \text{ or } (B \text{ and False})$ [$A \text{ and True} = A$]
= $A \text{ or False}$ [$B \text{ and False} = \text{False}$]
= A [$A \text{ or False} = A$]

✓

② $(A \text{ or } A) \text{ and } (B \text{ or not } B) = A$
= $A \text{ and } (B \text{ or not } B)$ [$A \text{ or } A = A$]
= $A \text{ and True}$ [$B \text{ or not } B = \text{True}$]
= A [$\text{A and True} = A$]



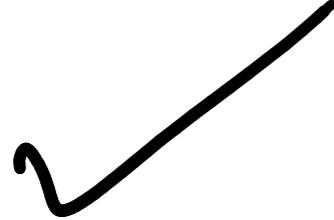
$$\begin{aligned}
 ③ (\text{not } A \text{ and } B) \text{ or } (\text{not } \bar{A} \text{ and } \text{not } B) \\
 &= \text{not } A \text{ and } (B \text{ or } \text{not } B) \quad [\text{distributive}] \\
 &= \text{not } A \text{ and } \text{True} \quad [B \text{ or } \text{not } B = \text{True}] \\
 &= \text{not } A \quad [A \text{ and } \text{True} = A]
 \end{aligned}$$

✓

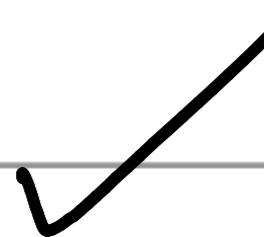
Solution is correct. But the actual problem
is not this!

$$\begin{aligned}
 &\underline{\text{not } (A \text{ and } B) \text{ or } (\text{not } A \text{ or } \text{not } B)} \\
 &= (\text{not } A \text{ or } \text{not } B) \text{ or } (\text{not } A \text{ or } \text{not } B) \\
 &= \text{not } A \text{ or } \text{not } B \\
 &= \text{not } (A \text{ and } B)
 \end{aligned}$$

(4) $(A \text{ and } B) \text{ or } (A \text{ and not } C) \text{ or } (\overline{A} \text{ and } \overline{C})$
= $A \text{ and } (B \text{ or not } C \text{ or } \overline{C})$ [distributive]
= $A \text{ and } (B \text{ or True})$ [not(C or \overline{C}) = True]
= $A \text{ and True}$ [$B \text{ or True}$ = True]
= A [$A \text{ and True}$ = A]



⑤ $A \text{ and } (B \text{ or } \neg B) \text{ and } C = A \text{ and } C$
= $A \text{ and } \text{True} \text{ and } C [B \text{ or } \neg B = \text{True}]$
= $A \text{ and } C [A \text{ and true} = A]$



⑥ $(A \text{ or } \text{not } A) \text{ and } (B \text{ or } C) = B \text{ or } C$
= True and $(B \text{ or } C)$ [A or not A = True]
= $(\text{True and } B) \text{ or } C$ [Associative]
= ~~$B \text{ or } C$~~ [True and $B = B$]

True and $(B \text{ or } C) = B \text{ or } C$

$(\text{or}) = (\text{True and } B) \text{ or } (\text{True and } C)$

= $B \text{ or } C$

$$\begin{aligned}
 & \dagger (A \text{ and } B) \text{ or } (\text{not } A \text{ and } B) \text{ or } (\text{not } (A \text{ and } B)) \\
 &= ((A \text{ or not } A) \text{ and } B) \text{ or } ((\text{or not } A) \text{ and } B) \text{ [distributive]} \\
 &= (\text{True and } B) \text{ or } ((\text{or not } A) \text{ and } 0) \text{ [A or not } A = \text{True}] \\
 &= 0 \text{ or } ((\text{or not } A) \text{ and } B) \text{ [True and } B = B] \\
 &= 0 \text{ or } (\text{True and } B) \text{ [or not } A = \text{True}] \\
 &= 0 \text{ or } 0 \text{ [True and } 0 = 0]
 \end{aligned}$$

Use parentheses correctly!

When you are using distributive law,
put the whole expression in
parentheses

$$\begin{aligned} \textcircled{8} \quad & A \text{ or } (A \text{ and } B) \text{ and } (A \text{ and } C) = \\ & = A \text{ and } (A \text{ and } C) [A \text{ or } (A \text{ and } B) = A] \\ & = A \text{ and } C \quad X \end{aligned}$$

$$\begin{aligned} & A \text{ or } (A \text{ and } B) \text{ or } (A \text{ and } C) \\ \leq & A \text{ or } (A \text{ and } C) \\ = & A \end{aligned}$$

- ~~= A and not C~~
 ⑨ (A and B and C) or (A and not B and C) or (A and B and not C) or (A and not B and not C)
~~= A and (B and C or not B and C) or B and not C or not B and not C~~
~~= A and (B or not B and C and (or B and not C or not B and not C))~~
~~= A and (True and C and (or B and not C or B and not C))~~
~~= A and (C and (or B and not C or B and not C))~~
~~= A and (C or B and not C or B and not C)~~
~~= A and (C or not C or B and not C)~~
~~= A and (True or B and not C)~~
~~= A and (True and not (-C))~~
~~= A and not C~~

you need parentheses

$\equiv A \text{ and } ((B \text{ and } C) \text{ or } (\text{not } B \text{ and } C) \text{ or } (B \text{ and } \text{not } C))$

~~$\equiv A \text{ and } ((B \text{ and } C) \text{ or } (\text{not } B \text{ and } C) \text{ or } (B \text{ and } \text{not } C))$~~

$\equiv A \text{ and } ((\underbrace{(B \text{ or } \text{not } B) \text{ and } C)}_{\text{True}}) \text{ or } (\underbrace{(B \text{ or } \text{not } B) \text{ and } \text{not } C)}_{\text{True}})$

$\equiv A \text{ and } ((\underbrace{(B \text{ or } \text{not } B) \text{ and } C)}_{\text{True}}) \text{ or } (\underbrace{(B \text{ or } \text{not } B) \text{ and } \text{not } C)}_{\text{True}})$

$\equiv A \text{ and } (\underbrace{C}_{\text{True}}) \text{ or } (\underbrace{\text{not } C}_{\text{True}})$

$\equiv A \text{ and True}$

$\equiv A$

Another solution

$$= \underline{(A \text{ and } B \text{ and } C)} \text{ or } \underline{(A \text{ and } B \text{ and } \underline{\text{not } C})}$$

or $(A \text{ and } \text{not } B \text{ and } C) \text{ or } (A \text{ and } \text{not } B \text{ and } \underline{\text{not } C})$

$$= ((A \text{ and } B) \text{ and } \overline{(C \text{ or } \text{not } C)}) \quad (\text{Associative property})$$

or $\overbrace{(A \text{ and } \text{not } B) \text{ and } (C \text{ or } \text{not } C)}$

True

True

(Distributive property)

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

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

A

$\textcircled{10} (A \text{ or } B) \text{ and } (A \text{ or not } B) \text{ and } (\text{cor } D) \text{ and } (\text{cor not } D)$ $\stackrel{=} \text{True}$

$= (A \text{ or } B \text{ and not } B) \text{ and } (\text{or } D \text{ or not } D)$ [dist.
prop.]

$= A \text{ or True and } (\text{or } D \text{ or not } D)$

$= \text{True and } (\text{or } D \text{ or not } D)$ [A or True = True]

$= \text{True and } (\text{or True})$ [D or not D = True]

$= (\text{or True})$ $\stackrel{=} \text{True}$ [True and C = C]

$= \text{True}$

C

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

$= (A \text{ or } F) \text{ and } (C \text{ or } F)$

$= A \text{ and } C$