6. $A \uparrow A = \overline{A \cdot A} = \bar{A}$ $\because A \uparrow A = \overline{A' + A} = \bar{A}$

1. $\bar{A} = A \uparrow A$

2. $AB = (A \uparrow B) \uparrow (A \uparrow B)$

$\because A \uparrow B = \overline{AB}$

Therefore, $(A \uparrow B) \uparrow (A \uparrow B) = \overline{\overline{AB} \cdot \overline{AB}} = AB$

$(A \uparrow B) \uparrow (A \uparrow B) = AB$

3. $A + B = (A \uparrow A) \uparrow (B \uparrow B)$

$\because (A \uparrow A) = \bar{A}$ and $B \uparrow B = \bar{B}$

Therefore,

$(A \uparrow A) \cdot (B \uparrow B) = \underbrace{\overline{\bar{A} \cdot \bar{B}} = A + B}_{\text{De. Morgan's law}}$

$(A \uparrow A) \cdot (B \uparrow B) = A + B$

4. $\bar{A} = A \downarrow A$

$\because A \downarrow A = \overline{A + A} = \bar{A}$

Therefore, $\bar{A} = A \downarrow A$

5. $A + B = (A \downarrow B) \downarrow (B \downarrow A)$

$\because A + B = (A \downarrow B) \downarrow (A \downarrow B) \Rightarrow \overline{A + B} = A \downarrow B$

Therefore,

$(A \downarrow B) \downarrow (A \downarrow B) = \overline{\overline{A + B} + \overline{A + B}} = A + B$

$(A \downarrow B) \downarrow (A \downarrow B) = A + B$

6. $AB = (A \downarrow A) \downarrow (B \downarrow B)$

$\because A \downarrow A = \bar{A}$ and $B \downarrow B = \bar{B}$

Therefore,

$(A \downarrow A) \downarrow (B \downarrow B) = \underbrace{\overline{\bar{A} + \bar{B}} = AB}_{\text{De-Morgan's law}}$