1. Smoke $\Rightarrow$ Smoke

   $\equiv\ \neg$Smoke $\vee$ Smoke $\quad\equiv$ True

   Valid

2. Smoke $\Rightarrow$ Fire

   $\equiv\ \neg$Smoke $\vee$ Fire

   Neither

3. (Smoke $\Rightarrow$ Fire) $\Rightarrow$ ($\neg$Smoke $\Rightarrow$ $\neg$Fire)

   $\equiv$ ($\neg$Smoke $\vee$ Fire) $\Rightarrow$ ($\neg\neg$Smoke $\vee$ $\neg$Fire)

   $\equiv$ ($\neg$Smoke $\vee$ Fire) $\Rightarrow$ (Smoke $\vee$ $\neg$Fire)

   $\equiv\ \neg$($\neg$Smoke $\vee$ Fire) $\vee$ (Smoke $\vee$ $\neg$Fire)

   $\equiv$ (Smoke $\wedge$ $\neg$Fire) $\vee$ Smoke $\vee$ $\neg$Fire

   $\equiv$ (Smoke $\vee$ Smoke $\vee$ $\neg$Fire) $\wedge$ ($\neg$Fire $\vee$ Smoke $\vee$ $\neg$Fire)

   $\equiv$ (Smoke $\vee$ $\neg$Fire) $\wedge$ ($\neg$Fire $\vee$ Smoke)

   $\equiv\ \neg$Fire $\vee$ Smoke

   Neither

4. Smoke $\vee$ Fire $\vee$ $\neg$Fire

   $\equiv$ Smoke $\vee$ True $\quad\equiv$ True

   Valid

5. $\Big(\big((\text{Smoke} \wedge \text{Heat}) \Rightarrow \text{Fire}\big) \Leftrightarrow \big((\text{Smoke} \Rightarrow \text{Fire}) \vee (\text{Heat} \Rightarrow \text{Fire})\big)$

$\equiv (\neg \text{Smoke} \vee \neg \text{Heat} \vee \text{Fire}) \Leftrightarrow (\neg \text{Smoke} \vee \text{Fire} \vee \neg \text{Heat} \vee \text{Fire})$

$\equiv (\neg \text{Smoke} \vee \neg \text{Heat} \vee \text{Fire}) \Leftrightarrow (\neg \text{Smoke} \vee \neg \text{Heat} \vee \text{Fire})$

(设 $A = \neg \text{Smoke} \vee \neg \text{Heat} \vee \text{Fire}$)

$\equiv A \Leftrightarrow A \equiv (A \Rightarrow A) \wedge (A \Rightarrow A) \equiv (\neg A \vee A) \wedge (\neg A \vee A)$

$\equiv \text{True} \wedge \text{True} \equiv \text{True}$

Valid

6. $\text{Big} \vee \text{Dump} \vee (\text{Big} \Rightarrow \text{Dump})$

$\equiv \text{Big} \vee \text{Dump} \vee \neg \text{Big} \vee \text{Dump}$

$\equiv \text{True} \vee \text{Dump} \quad \equiv \text{True}$

Valid

7. $(\text{Big} \wedge \text{Dump}) \vee \neg \text{Dump}$

$\equiv (\text{Big} \vee \neg \text{Dump}) \wedge (\text{Dump} \vee \neg \text{Dump})$

$\equiv (\text{Big} \vee \neg \text{Dump}) \wedge \text{True}$

$\equiv (\text{Big} \vee \neg \text{Dump})$

Neither