As mentioned in the lecture, saying

"two propositional forms **** and ****** are equivalent" is the <u>same as saying</u>

" **** $\Leftrightarrow$ ****** is a tautology "

Some useful tautologies

$$P \vee (Q \vee R) \quad \Leftrightarrow \quad (P \vee Q) \vee R$$ (and also, for $\wedge$)

$$P \vee (Q \wedge R) \quad \Leftrightarrow \quad (P \vee Q) \wedge (P \vee R)$$

$$P \wedge (Q \vee R) \quad \Leftrightarrow \quad (P \wedge Q) \vee (P \wedge R)$$

Excluded Middle $P \vee \sim P$

DeMorgan's Rules

$$\sim (P \vee Q) \quad \Leftrightarrow \quad \sim P \wedge \sim Q$$

$$\sim (P \wedge Q) \quad \Leftrightarrow \quad \sim P \vee \sim Q$$

Modus Ponens $(P \wedge (P \Rightarrow Q)) \Rightarrow Q$

$$(P \Rightarrow Q) \quad \Leftrightarrow \quad (\sim Q \Rightarrow \sim P)$$

(a conditional is equivalent to its contrapositive)

$(P \Leftrightarrow Q)$ is equivalent to $(P \Rightarrow Q) \wedge (Q \Rightarrow P)$

$(P \Rightarrow Q)$ is equivalent to $Q \vee \sim P$

$(P \Rightarrow Q)$ is equivalent to $\sim (P \wedge \sim Q)$