

## Home Work # 2

Theorem 1.1.2

$$(e) \quad P \Rightarrow (Q \Rightarrow R) = \sim P \vee (Q \Rightarrow R) \quad \text{from (a)}$$

$$= \sim P \vee (\sim Q \vee R) \quad \text{from (a)}$$

$$\equiv \sim (P \wedge Q) \vee R \quad \text{from De Morgan's Law}$$

$$\equiv P \wedge Q \Rightarrow R \quad \text{from a}$$

$$(g) \quad (P \vee Q) \Rightarrow R \equiv (P \Rightarrow R) \wedge (Q \Rightarrow R)$$

$$(P \vee Q) \Rightarrow R = \sim (P \vee Q) \vee R$$

$$\equiv \sim P \wedge \sim Q \vee R$$

$$\equiv R \vee (\sim P \wedge \sim Q)$$

$$\equiv (R \vee \sim P) \wedge (R \vee \sim Q)$$

$$\equiv (\sim P \vee R) \wedge (\sim Q \vee R)$$

$$\equiv (P \Rightarrow R) \wedge (Q \Rightarrow R)$$

Alternative:

$(P \vee Q) \Rightarrow R$  is F exactly when  $P \vee Q$  is T and  $R$  is F  
" " " one of  $P$  or  $Q$  is T and  $R$  is F  
" " "  $P$  is T and  $R$  is F or  $Q$  is T and  $R$  is F  
" " "  $(P \Rightarrow R) \wedge (Q \Rightarrow R)$  is F  
" " "  $(P \Rightarrow R) \wedge (Q \Rightarrow R)$  is F