ctice 4

$P(x)$ = "I take the day x off"

$R(x)$ = "It rains on x day"

$Q(x)$ = "It snows on x day"

Steps	Reason:
1. $\forall x(P(x) \rightarrow (R(x) \vee Q(x)))$	Premise
2. $P(\text{Tuesday}) \vee P(\text{Thursday})$	Premise
3. $\neg(R(\text{Tuesday}) \vee Q(\text{Tuesday}))$	Premise
4. $\neg Q(\text{Thursday})$	Premise
5. $P(\text{Tuesday}) \rightarrow (R(\text{Tuesday}) \vee Q(\text{Tuesday}))$	Universal instantiation from Step 1
6. $P(\text{Thursday}) \rightarrow (R(\text{Thursday}) \vee Q(\text{Thursday}))$	Universal instantiation from Step 1
7. $\neg P(\text{Tuesday})$	modus tollens from step 3 and 5
8. $P(\text{Thursday})$	Disjunctive syllogism from step 2 and 7
9. $R(\text{Thursday}) \vee Q(\text{Thursday})$	Modus ponens from step 6 and 8

10. $R(\text{Thursday})$ Disjunctive syllogism from step 4 and 6

Conclusions: "I did not take Tuesday off": Step 7

"I took Thursday off": Step 8

"It rained Thursday": Step 10

b) $P(x)$ = "x is a computer science major"

$Q(x)$ = "x has a personal computer"

Step	Reason
1. $\forall x(P(x) \rightarrow Q(x))$	Premise
2. $\neg Q(\text{Ralph})$	Premise
3. $Q(\text{Ann})$	Premise
4. $P(\text{Ralph}) \rightarrow Q(\text{Ralph})$	Universal instantiation from step 1
5. $\neg P(\text{Ralph})$	Modus tollens from step 2 and 4

Conclusions: "Ralph is not a computer science major" from step 5

Exercise 2: Identify the error or errors in this argument that supposedly shows that if $\forall x(P(x) \vee Q(x))$ is true then $\forall x P(x) \vee \forall x Q(x)$ is true. Explain your reasoning

1. $\forall x(P(x) \vee Q(x))$	Premise
2. $P(c) \vee Q(c)$	Universal instantiation from (1)
3. $P(c)$	Simplification from (2)
4. $\forall x P(x)$	Universal generalization from (3)
5. $Q(c)$	Simplification from (2)
6. $\forall x Q(x)$	Universal generalization from (5)
7. $\forall x(P(x) \vee \forall x Q(x))$	Conjunction from (4) and (6)

Error in steps 3 and 5 for Simplification

Simplification cannot be used, because it needs a conjunction, not a disjunction.