# Problem 9.2

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**Proof By Induction**

B. Case

| A | $A \lor \neg A$ |
|---|---|
| T | T |
| F | T |

| A | B | $A \land B \Rightarrow B \land A$ |
|---|---|---|
| T | T | T |
| T | F | T |
| F | T | T |
| F | F | T |

$\therefore$ The axioms hold validity

□

Ind. Step

$A \Rightarrow B \equiv \neg A \lor B$
$\neg B \Rightarrow \neg A \equiv B \lor \neg A$

Lemma 1: $A \lor B \equiv B \lor A$
Proof:

| A | B | $A \lor B$ | $B \lor A$ |
|---|---|---|---|
| T | T | T | T |
| T | F | F | F |
| F | T | T | T |
| F | F | T | T |

By Lemma 1 $\neg A \lor B \equiv B \lor \neg A$
$A \Rightarrow B \equiv \neg B \Rightarrow \neg A$
$\therefore$ Transp maintains validity

By Lemma 10.4.4(From the slides) Subst preserves validity
$\therefore$ Ind. Step holds

□