

Use a truth table to prove the following logical equivalence.

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

Solution:

| $P$ | $Q$ | $R$ | $Q \vee R$ | $P \wedge (Q \vee R)$ | $P \wedge Q$ | $P \wedge R$ | $(P \wedge Q) \vee (P \wedge R)$ |
|-----|-----|-----|------------|-----------------------|--------------|--------------|----------------------------------|
| $T$ | $T$ | $T$ | $T$        | <b>T</b>              | $T$          | $T$          | <b>T</b>                         |
| $T$ | $T$ | $F$ | $T$        | <b>T</b>              | $T$          | $F$          | <b>T</b>                         |
| $T$ | $F$ | $T$ | $T$        | <b>T</b>              | $F$          | $T$          | <b>T</b>                         |
| $T$ | $F$ | $F$ | $F$        | <b>F</b>              | $F$          | $F$          | <b>F</b>                         |
| $F$ | $T$ | $T$ | $T$        | <b>F</b>              | $F$          | $F$          | <b>F</b>                         |
| $F$ | $T$ | $F$ | $T$        | <b>F</b>              | $F$          | $F$          | <b>F</b>                         |
| $F$ | $F$ | $T$ | $T$        | <b>F</b>              | $F$          | $F$          | <b>F</b>                         |
| $F$ | $F$ | $F$ | $F$        | <b>F</b>              | $F$          | $F$          | <b>F</b>                         |