



**Exercise 1.** Let  $P$  and  $Q$  be statements. Verify the following logical equivalences by either constructing a truth table or by using established equivalences.

a.  $P \wedge P \cong P \vee P \cong P$

b.  $P \Rightarrow Q \cong \neg Q \Rightarrow \neg P$

c.  $(P \Rightarrow Q) \wedge (\neg P \Rightarrow Q) \cong Q$

d.  $(P \wedge \neg Q) \Rightarrow \neg P \cong P \Rightarrow Q$

**Exercise 2.** Textbook exercise 1.2.3

**Exercise 3.** Textbook exercise 1.2.6

**Exercise 4.** Textbook exercise 1.2.8

**Exercise 5.** Textbook exercise 1.2.12

**Exercise 6.** Textbook exercise 1.2.13

**Exercise 7.** Textbook exercise 1.5.5

**Exercise 8.** Textbook exercise 1.5.10