

1. Homework

Due **9/9/09** before class

Most exercises on this homework are exercises from the textbook. Please refer to the corresponding exercise sections in the textbook (Rosen, 6th edition).

- 1.1 (a) (1.5 points) 10 b, d, e
- (b) (2.5 points) Construct a truth table for each of the following compound propositions:
- $p \rightarrow \neg p$
 - $(q \rightarrow \neg p) \vee (\neg p \rightarrow \neg q)$
 - $(p \vee \neg q) \wedge (p \vee r)$
- (c) (2 points) Read the definition of *converse*, *inverse*, and *contrapositive* on page 8 of the book.
- Let p be “it rains” and let q be “the streets are wet”. Express $p \rightarrow q$ as well as the converse, the inverse, and the contrapositive in English.
- 1.2 (a) (1 point) 8 a, b
- (b) i. (1 point) Show 22 using truth tables.
- ii. (2 points) Show 22 by establishing a sequence of equivalences. You may only use equivalences in Table 6 and the first equivalence in Table 7. **Annotate EVERY step with the equivalence name (and table number) that you used. This annotation is worth 1 point.**
- (c) (1 point) 60 b. Justify your answer shortly.
- 1.3 (a) (1 point) 2 c,d
- (b) (2 points) Translate these statements into English, where $C(x)$ is “is a computer scientist” and $P(x)$ is “knows how to program” and the domain consists of all students at UTSA.
- $\exists x : P(x)$
 - $\forall x : (C(x) \wedge P(x))$
 - $\forall x : (P(x) \rightarrow C(x))$
 - $\exists x : (C(x) \wedge \neg P(x))$

(c) (2 points) Let $C(x)$ and $P(x)$ be defined as above. Express each of the following statements in terms of $C(x), P(x)$, quantifiers, and logical connectives. Let the domain consist of all students at UTSA.

- i. No student at UTSA knows how to program.
- ii. It is not true that all students at UTSA know how to program.
- iii. Some student at UTSA does not know how to program.
- iv. All computer scientists at UTSA know how to program.

(d) (1 point) 14 a,d

(e) (1 point) 18 b,e