CSE 311: Foundations of Computing I

Section 1: Logic

1. Exclusive Or

For each of the following, decide whether inclusive-or or exclusive-or is intended:

(a) Experience with C or Java is required.

(b) Lunch includes soup or salad.

(c) Publish or perish

(d) To enter the country you need a passport or Global Entry card.

2. Translations

For each of the following, define propositional variables and translate the sentences into logical notation.

(a) I will remember to send you the address only if you send me an e-mail message.

(b) If berries are ripe along the trail, hiking is safe if and only if grizzly bears have not been seen in the area.

(c) Unless I am trying to type something, my cat is either eating or sleeping.

3. Teatime

Consider the following sentence:

If I am drinking tea then I am eating a cookie, or, if I am eating a cookie then I am drinking tea.

(a) Define propositional variables and translate the sentence into an expression in logical notation.

(b) Fill out a truth table for your expression.

(c) Based on your truth table, classify the original sentence as a contingency, tautology, or contradiction.

4. Truth Tables

Write a truth table for each of the following:

(a) $(p \oplus q) \vee (p \oplus \neg q)$

(b) $(p \vee q) \rightarrow (p \oplus q)$

(c) $p \leftrightarrow \neg p$

5. Non-equivalence

Prove that the following pairs of propositional formulae are not equivalent by finding inputs they differ on.

(a) $p \rightarrow q$ $\qquad\qquad\qquad$ $q \rightarrow p$

(b) $p \rightarrow (q \wedge r)$ $\qquad\qquad$ $(p \rightarrow q) \wedge r$

6. Circuitous

Translate the following circuit into a logical expression.