CSE311: Review Problems, May 3, 2012

1. Explain without using truth tables why the following compound proposition is true only when p, q, r have the same values:

$$(p \vee \neg q) \wedge (q \vee \neg r) \wedge (r \vee \neg p)$$

2. Are the following two equivalent?

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

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

3. Section 1.5 [6th ed.: Section 1.4], Problem 25

4. Section 1.5 [6th ed.: Section 1.4], Problem 40

5. Prove the following:

$$\wp(A) \subseteq \wp(B) \leftrightarrow A \subseteq B$$

6. Both editions, Section 2.2, Problem 25

7. For all functions and mappings below, state whether they are injective, surjective or both (bijective):

   (a) $f : A \rightarrow B$, $f(x) = \frac{1}{x}$
   (b) $f : B \rightarrow C$, $f(x) = x^2$
   (c) $f : B \rightarrow B$, $f(x) = x^2$
   (d) $f : C \rightarrow B$, $f(x) = x^2$

   where:

   (a) $A = \{x | x \in \Re, x \geq 1\}$
   (b) $B = \{x | x \in \Re, 0 \leq x \leq 1\}$
   (c) $C = \{x | x \in \Re, -1 \leq x \leq 1\}$

8. Which of the following integers is congruent to $3 mod 7$?

   (a) 37
   (b) 66
   (c) -17
   (d) -67

9. Section 4.3, Problem 32 [6th ed.: Section 3.7, Problem 24]

10. Section 4.3, Problem 51 [6th ed.: Section 3.6, Problem 33]

11. Using $p = 29$ and $q = 47$ encrypt the message "NO" using the RSA cryptosystem