CSC 503 Homework Assignment 3

Out: September 4, 2015
Due: September 11, 2015
MISSING-ID

1. [20 points] Construct a formula ϕ in **DNF** to match the following truth table:

p	q	ϕ
T	T	T
T	F	F
F	T	T
F	F	F

2. [20 points] Construct a formula ϕ in **CNF** to match the following truth table:

p	q	r	ϕ
T	T	T	T
T	T	F	F
T	F	T	F
T	F	F	F
F	T	T	F
F	T	F	T
F	F	T	T
F	F	F	T

3. [30 points] Consider the atomic sentences

p = The cow jumped over the moon.
q = The little dog laughed.
r = The dish ran away with the spoon.

Using these, form the three complex statements

(a) If the cow jumped over the moon and the little dog laughed, then the dish ran away with the spoon.

(b) If the little dog laughed, then the cow jumped over the moon.

(c) If the dish ran away with the spoon, then the little dog laughed.

Show that these three complex statements are logically independent of each other by providing, for each of these three complex statements, a truth assignment to the atomic sentences that makes the complex statement false and the other complex statements true.

4. [30 points] Apply algorithm HORN from page 66 of the textbook to the following Horn formula.

$$
\begin{array}{ll}
(\top \rightarrow q) & \wedge \\
(\top \rightarrow s) & \wedge \\
(w \rightarrow \bot) & \wedge \\
(p \wedge q \wedge s \rightarrow \bot) & \wedge \\
(v \rightarrow s) & \wedge \\
(\top \rightarrow r) & \wedge \\
(r \rightarrow p) & \wedge \\
(p \wedge s \rightarrow s) &
\end{array}
$$

Your answer should list propositional letters in the order in which they are marked as well as giving the overall answer.