Section TA: _____ Name: Solution

1. (4 points) For the truth table below, give *either*, the compound proposition that is the Disjunctive Normal Form or the compound proposition that is the Conjunctive Normal Form (but not both). **One extra credit point for correctly identifying if you are giving DNF or CNF.**

| p | q | r | f(p,q,r) |
|---|---|---|---|
| 0 | 0 | 0 | 1 |
| 0 | 0 | 1 | 1 |
| 0 | 1 | 0 | 0 |
| 0 | 1 | 1 | 1 |
| 1 | 0 | 0 | 1 |
| 1 | 0 | 1 | 0 |
| 1 | 1 | 0 | 0 |
| 1 | 1 | 1 | 1 |

$DNF = (\neg P \wedge \neg Q \wedge \neg R) \vee (\neg P \wedge \neg Q \wedge R) \vee (\neg P \wedge Q \wedge R) \vee (P \wedge \neg Q \wedge \neg R) \vee (P \wedge Q \wedge R)$

~~$CNF = (\neg P \vee Q \vee \neg R) \wedge (P \vee \neg Q \vee R) \wedge (P \vee Q \vee \neg R)$~~

$CNF = (\neg P \vee Q \vee \neg R) \wedge (P \vee \neg Q \vee R) \wedge (P \vee Q \vee \neg R)$

2. (2 points) Give the dual of the compound proposition provided above.

compound of $DNF = (\neg P \vee \neg Q \vee R) \wedge (\neg P \vee \neg Q \vee R) \wedge (\neg P \vee Q \vee R) \wedge (P \vee \neg Q \vee \neg R) \wedge (P \vee Q \vee R)$

Similar things to CNF

3. (4 points) For each set $S$ below, give the cardinality ($|S|$) and the power set ($P(S)$),

(a) $\phi$ $|S| = 0$ $P(S) = \{\{\phi\}\}$

(b) $\{a, \{a\}\}$ $|S| = 2$ $P(S) = \{\phi, \{a\}, \{\{a\}\}, \{a, \{a\}\}\}$

(c) $\{\{a\}\}$ $|S| = 1$ $P(S) = \{\phi, \{\{a\}\}\}$

(d) $\{a, \{a\}, \{a, \{a\}\}\}$ $|S| = 3$

$P(S) = \{\underset{1}{\phi}, \underset{2}{\{a\}}, \underset{3}{\{\{a\}\}}, \underset{4}{\{\{a, \{a\}\}\}}, \underset{5}{\{a, \{a\}\}}, \underset{6}{\{a, \{a, \{a\}\}\}}, \underset{7}{\{\{a\}, \{a, \{a\}\}\}}, \underset{8}{\{a, \{a\}, \{a, \{a\}\}\}}\}$