

Homework #1

Due date: 2016.03.23.Wed

1. Suppose that the domain of $Q(x,y,z)$ consists of triples x,y,z , where $x = 0,1, \text{ or } 2$, $y=0 \text{ or } 1$, and $z=0 \text{ or } 1$. Write out these propositions using disjunctions and conjunctions.

(a) $\forall y Q(0,y,0)$

(b) $\exists x Q(x,1,1)$

(c) $\exists z \neg Q(0,0,z)$

(d) $\exists x \neg Q(x,0,1)$

2. Determine the truth value of each of these statements if the domain for all variables consists of all integers. (You do not need to prove. Just answer it with T or F.)

(a) $\forall n \exists m (n^2 < m)$

(b) $\forall n \exists m (n+m=0)$

(c) $\exists n \exists m (n+m=4 \wedge n-m=2)$

(d) $\exists n \forall m (nm = m)$

3. Obtain disjunctive normal form, conjunctive normal form, principal disjunctive normal form, and principal conjunctive normal form for the following expressions given in (a), (b) (DNF and CNF is not unique.)

(a) $Q \wedge (P \vee \neg Q)$

(b) $(Q \rightarrow P) \wedge (\neg P \wedge Q)$

4. Show that if n is an integer and n^3+5 is odd, then n is even using

(a) a proof by contraposition

(b) a proof by contradiction