Homework 2

CMPSC 360

Kinner Parikh

January 24, 2022

Question 1:

1. This is a statement because the truth value of the statement can be determined: Obama was the president during 2010 or not
2. This is a statement becuase the quantity x + 3 could be a positive integer or not, which means the truth value can be determined
3. This is a statement because 15 is either an odd number or it is not
4. This is a statement becuase a natural number times two has the possibility of being an even number - the truth value can be determined
5. This is not a statement because it is an open ended question. There is no truth value that can be determined.

Question 2:

a) If $1 + 1 = 3 \rightarrow$ F, then dogs can fly $\rightarrow$ F $\Rightarrow \underline{\text{T}}$
b) If $1 + 1 = 2 \rightarrow$ T, then dogs can fly $\rightarrow$ F $\Rightarrow \underline{\text{F}}$
c) If $2 + 2 = 4 \rightarrow$ T, then $1 + 2 = 3 \rightarrow$ T $\Rightarrow \underline{\text{T}}$

Question 3:

1. a

Question 4:

Question 5:

Question 6:

Question 7:

Question 8:

Simplify $\neg((r \rightarrow \neg p) \wedge (r \rightarrow p))$

$\neg(r \rightarrow \neg p) \vee \neg(r \rightarrow p)$	DeMorgan's Law
$\neg(\neg r \vee \neg p) \vee \neg(\neg r \vee p)$	Identity Rule
$(\neg\neg r \wedge \neg\neg p) \vee (\neg\neg r \wedge \neg p)$	DeMorgan's Law
$(r \wedge p) \vee (r \wedge \neg p)$	Double Negation
$r \vee (p \wedge \neg p)$	Distribution
$r \vee F$	Contradiction
r	Identity Rules

Question 9:

Prove that $[p \to (q \vee r)] \equiv [(p \wedge \neg q) \to r]$

$p \to (q \vee r)$	
$\neg p \vee (q \vee r)$	Identity Rule
$(\neg p \vee q) \vee r$	Associative Rule
$\neg(\neg\neg p \wedge \neg q) \vee r$	DeMorgan's Law
$\neg(p \wedge \neg q) \vee r$	Double Negation
$\underline{(p \wedge \neg q) \to r}$	Identity Rule

$(p \wedge \neg q) \to r$	
$\neg(p \wedge \neg q) \vee r$	Identity Rule
$(\neg p \vee \neg\neg q) \vee r$	DeMorgan's Law
$(\neg p \vee q) \vee r$	Double Negation
$\neg p \vee (q \vee r)$	Associative Rule
$\underline{p \to (q \vee r)}$	Identity Rule

Question 10: