Quiz 3: October 14, 2021

Name: _____

Student ID: _____

For this quiz, refer to these laws and identities for Propositional Calculus:

Name	Equivalence	
Identity Laws	$p \wedge \mathbf{T} \equiv p$	$p \vee \mathbf{F} \equiv p$
Domination Laws	$p \vee \mathbf{T} \equiv \mathbf{T}$	$p \wedge \mathbf{F} \equiv \mathbf{F}$
Idempotent Laws	$p \vee p \equiv p$	$p \wedge p \equiv p$
Double Negative Law	$\neg(\neg p) \equiv p$	
Commutative Laws	$p \vee q \equiv q \vee p$	$p \wedge q \equiv q \wedge p$
Associative Laws	$(p \vee q) \vee r \equiv p \vee (q \vee r)$	$(p \wedge q) \wedge r \equiv q \wedge (p \wedge r)$
Distributive Laws	$p \vee (q \wedge r) \equiv (p \vee q) \wedge (p \vee r)$	$p \wedge (q \vee r) \equiv (p \wedge q) \vee (p \wedge r)$
De Morgan's Laws	$\neg(p \wedge q) \equiv \neg p \vee \neg q$	$\neg(p \vee q) \equiv \neg p \wedge \neg q$
Absorption Laws	$p \vee (p \wedge q) \equiv p$	$p \wedge (p \vee q) \equiv p$
Negation Laws	$p \vee \neg p \equiv \mathbf{T}$	$p \wedge \neg p \equiv \mathbf{F}$
Def. of implication	$(p \rightarrow q) \equiv (\neg p \vee q)$	
Def. of equivalence	$\mathbf{p \leftrightarrow q \equiv (p \rightarrow q) \wedge (q \rightarrow p) \equiv (p \wedge q) \vee (\neg p \wedge \neg q)}$	

1. The questions below start with the formula $f(a, b, c) = (\neg a \wedge \neg b) \vee (a \wedge c)$

   (a) (1 points) Give us the truth table for $f(a, b, c)$.

   (b) (2 points) Give us the Conjunctive Normal Form (CNF–also known as Product of Sums, POS) for $f(a, b, c)$

   (c) (2 points) Give the Dual of your solution for Part b of this question.

2. (5 points) Use the provided laws and identities to prove that $[p \wedge (p \rightarrow q)] \rightarrow q$ is a tautology.