Name: _________________________

Quiz 2, CSCE 222-502

1. Show that the following is a tautology:

\[(p \land q) \rightarrow (p \rightarrow q)\]

\[\neg(p \land q) \lor (p \rightarrow q) \text{ By Conditional logical equivalence}\]

\[\neg(p \land q) \lor (\neg p \lor q) \text{ By Conditional logical equivalence}\]

\[(\neg p \lor \neg q) \lor (\neg p \lor q) \text{ By De Morgan’s Law}\]

\[(\neg p \lor \neg q) \lor (\neg q \lor q) \text{ By Associative laws}\]

\[(\neg p \lor \neg q) \lor T \text{ By Negation Laws}\]

\[T \text{ By Domination Laws}\]

Note: You did not have to include the rationales (e.g. By …).

2. Let \(P(x)\) be the statement “\(x\) can speak Russian” and let \(Q(x)\) be the statement “\(x\) knows the computer language C++.” Express each of these sentences in terms of \(P(x), Q(x),\) quantifiers, and logical connectives. The domain for quantifiers consists of all students at Texas A&M University.

a. There is a student at your school who can speak Russian and who knows C++.

\[\exists x(P(x) \land Q(x))\]

b. Every student at your school either can speak Russian or knows C++.

\[\forall x(P(x) \oplus Q(x))\]

The word either implies exclusive sense of or.