Fall 2025

CSCI 2011 Assignment 2: Propositional Logic

Due Tuesday 9/23/2025 at 11pm

Answer all 6 questions worth 2.5 points each for a total of 15 points

Question1:

Us e the rules of inference to show that the hypotheses "if it does not rain or if it is not foggy, then the sailing race will be held and the lifesaving demonstration will go on," "if the sailing race is held, then the trophy will be awarded," and "the trophy was not awarded" imply the conclusion "it rained."

Question 2:

. Let $C(x)$ be the statement "x has a cat," let $D(x)$ be the statement "x has a dog," and let $F(x)$ be the statement "x has a ferret." Express each of these statements in terms of $C(x)$, $D(x)$, $F(x)$, quantifiers, and logical connectives. Let the domain consist of all students in your class.

a) A student in your class has a cat, a dog, and a ferret.
b) All students in your class have a cat, a dog, or a ferret.
c) Some student in your class has a cat and a ferret, but not a dog.
d) No student in your class has a cat, a dog, and a ferret.
e) For each of the three animals, cats, dogs, and ferrets, there is a student in your class who has this animal as a pet.

Question 3:

Determine the truth vale of each of these statements if the domain of each variable consists of real numbers. Justify your answer.

a) $\forall x \exists y\,(x^2 = y)$
b) $\forall x \exists y\,(x = y^2)$
c) $\exists x \forall y\,(xy = 0)$
d) $\exists x \exists y\,(x + y \neq y + x)$
e) $\forall x\,(x \neq 0 \rightarrow \exists y\,(xy = 1))$

Question 4

Prove that if *m* and *n* are integers and *mn* is even, then *m* is even, or *n* is even.

Question 5:

20. Prove that if n is an integer and $3n + 2$ is even, then n is even using

a) a proof by contraposition.

b) a proof by contradiction.

Question 6:

Prove that statements (i) and (ii) are equivalent, that is (i) iff (ii)

(i) n^2 is odd, (ii) $1 - n$ is even.