Quantified Logic: Predicate Calculus

13. <u>Practice problems</u>

For each of the following arguments, state if the argument is valid or invalid. If valid, state the applicable rule of inference. If invalid, state the error.

(1)   If MIDN Roy solves the problem correctly then he says the answer is "Yes."
       He said the answer is "Yes."
       ∴ MIDN Roy solved the problem correctly.

(2)   If I get less than 50 on the next quiz I will throw up.
       I scored a 99 on the next quiz
       ∴ I did not throw up.

(3)   All midshipmen must attend morning formation.
       Yates must attend morning formation.
       ∴ Yates is a midshipman.

(4)   All hungry midshipmen think King Hall food tastes good.
       MIDN Aird in not hungry.
       ∴ MIDN Aird thinks King Hall food sucks

(5)   If MIDN Brant is a bad logician then MIDN Brant will say "Invalid."
       MIDN Brant says "Invalid."
       ∴ MIDN Brant is a bad logician.

(6)   If we bomb every cave then we will kill Osama Bin Laden.
       We did not kill Osama Bin Laden
       ∴ We did not bomb every cave.

(7)   All Republicans want to increase military spending.
       Senator McCain wants to increase military spending.
       ∴ Senator McCain is a Republican.

(8)   All midshipmen who are geeks think playing video games is a waste of time.
       MIDN Cleary is not a geek.
       ∴ MIDN Cleary thinks that playing video games is not a waste of time.

Express the following statement using symbolic logic:

(9)   All midshipmen have a uniform that they hate.

(10) Express the negation of your answer to question 9 using symbolic logic.

Express the following statement using symbolic logic:

(11) There is a member of the Brigade of Midshipmen who personally knows at
      least one midshipman in every Company.

(12) What would you have to do to determine that the statement in question 11
      is false?

(13) Express the negation of your answer for question 11 using symbolic logic.

(14) Rewrite the statement: "The product of any two odd integers is odd."

      in the form: ∀ _____ , if _____ then _____

(15) Rewrite the statement: "Some questions are easy."

      in the form: ∃ _____ s.t. _____

(16) Let Real(x) be "x is a real number,"
           Pos(x) be "x is a positive real number"
           Neg(x) be "x is a negative real number".

      Translate the following statement to plain English:

               ∀ x, Real(x) ∧ Neg(x) → Pos(-x)

(17)   Which of the following is a negation of the statement

        "All discrete mathematics students are athletic."

        a.   There is a discrete mathematics student who is non-athletic.
        b.   All discrete mathematics students are non-athletic.
        c.   There is an athletic person who is a discrete mathematics student.
        d.   No discrete mathematics students are athletic.
        e.   Some discrete mathematics students are non-athletic
        f.   Some non-athletic people are not discrete mathematics students.

(18)   Write an informal negation of the following statements.

       All pots have lids.

       All birds can fly

       Some pigs can fly

       Some dogs have spots.

(19) Consider the statement "There are no simple solutions to life's problems."

Express the statement using symbolic logic.

What is the negation of this statement?

(20) Write a negation for this statement:

∀ computer programs P, if P compiles without error, then P is correct.

(21) Determine if the proposed negation is correct:

Statement: The sum of any two irrational numbers is irrational.

Proposed negation: The sum of any two irrational numbers is rational

(22) Write a negation for the statement: $\forall x \in R, x^2 \geq 1 \rightarrow x > 0$.

(23) Write a negation for the statement: $\forall n \in Z$, n prime $\rightarrow$ n is odd or n = 2.

(24) Write this statement in if-then form.

Being divisible by 8 is a sufficient for an integer to be divisible by 4.

(25) Express the statement and its negation in symbolic logic:

Having a large income is not necessary for a person to be happy.