Homework 2

MATH 300 (due Sep 20) Sep 13, 2024

Problem 1. Formalize each of the following statements using the predicate calculus (that is, find the predicate and write using the symbols of prediacte calculus, and predicates $p(x), q(x), \ldots$).

(a) Every real solution of $x^2 - 5x + 6 = 0$ is positive.

(b) Every prime number is greater than 1.

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Problem 2. For each of the following statements, write the negation of the sentences **without** the negation symbol "¬", and prove the negation of (2):

1. $\exists\epsilon((\epsilon > 0) \wedge (\forall x(x > 0 \Rightarrow x > \epsilon)))$.

2. $\forall x((x > 5) \Leftrightarrow (\forall y(y > -100)))$.
   (Hint: Recall that $A \Leftrightarrow B \equiv (A \Rightarrow B) \wedge (B \Rightarrow A)$)

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Problem 3. Prove the following statement:

If both a and b are divisible by n, then $a - b$ is divisible by n.

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Problem 4. Prove the following implication:

If n is even then $n + 2$ is even.