163 In class 2 Name: _____

1. Let $N(x)$ be the statement "x has been to England" where the domain is all students in this class. Express the following in simple English:

   (a) $\forall x N(x)$

   (b) $\exists x N(x)$

   (c) $\exists! x N(x)$

   (d) $\neg \forall x N(x)$

2. Translate these sentences in to English, where $M(x)$ is "x is a millionaire" and $P(x)$ is "x drives a Porche"

   (a) $\forall x(M(x) \to P(x))$

   (b) $\exists x(M(x) \to P(x))$

   (c) $\forall x(M(x) \wedge P(x))$

   (d) $\exists x(M(x) \wedge P(x))$

3. Determine the truth value of the following with domain all integers.

   (a) $\forall n(n + 1 > n)$

   (b) $\exists n(2n = 3n)$

   (c) $\exists n(n = -n)$

   (d) $\forall n(3n > 4n)$

4. Translate each of the following statments in to logical expressions using predicates, quantifiers and logical connectives.

   (a) No one is perfect.

   (b) Not everyone is perfect.

   (c) All my friends are perfect.

   (d) All my friends are dead or in jail.

5. Express the negation of the following propositions using quantifiers, then express the negation in English:

   (a) Some people have no common sense.

   (b) All Swedish movies are boring.

   (c) No one can keep a secret.

   (d) Someone in this class has a bad attitude.