Foundations of Mathematics   Math 300 Sections 902, 905
Thursday 3 September 2020   Class worksheet

1. Use the roster method to specify the elements in each of the following sets and then write a sentence in English describing the set.

   (a) $\{x \in \mathbb{R} \mid x^2 - 2x - 4 = 0\}$.

   (b) $\{n \in \mathbb{Z} \mid n^2 < 27\}$.

   (c) $\{n \in \mathbb{N} \mid n^2 < 27\}$.

   (d) $\{x \in \mathbb{Q} \mid x^2 - 2x - 4 = 0\}$.

2. Use set builder notation to specify the following sets.

   (a) The set of all natural numbers with square at least 15.

   (b) The set of all odd integers.

   (c) The set of all real numbers at most 10 whose square exceeds 3.

   (d) The set of positive rational numbers.

3. Write the following English sentences as mathematical statements involving quantifiers.

   (a) A trangle has three sides.

   (b) The square of a real number is nonnegative.

   (c) Some Aggies are not Human.

   (d) An integer is necessarily prime or composite.

   (e) Some even numbers are divisible by two and are divisible by seven.

   (f) The sum of two even integers is an odd integer.

   (g) Irrational numbers are real.

4. Negate each of the quantified statements from Question 1.

5. Recall the following property of the integers:
   "If n is an integer, then there is an ingeger m with the property that $n + m = 0$."

   (a) Write this as a statement involving quantifiers.

   (b) Give a useful negation of this statement.

   (c) What is this property called?