Math 3000, Homework assignment #1

- Read section 2.1.
- Turn in all of the following problems:

Problem 1. Write the following neighborhoods as open intervals:

a) $N(0; 1/2)$

b) $N(0.399; 0.001)$

Problem 2. Write the following intervals as neighborhoods. Example: $(1, 3) = N(2; 1)$.

a) $(0, 1)$

b) $(2, 2.2)$

c) $(-1, -0.5)$

d) $(-0.001, 0.004)$

Problem 3. Write the following both in the form $N(x; \varepsilon)$ for suitable x and $\varepsilon > 0$, and as an open interval.

a) $\{y : |y - 2| < 1/3\}$

b) $\{y : |y + \pi| < \pi/4\}$

Problem 4. For each set below, state which points are interior points and which points are boundary points of the set. (Remember: a boundary point of a set may or may not be a point in the set itself!)

a) $[1, 5]$

b) $(-2015, -2014)$

c) $\mathbb{R}$ (the set of all real numbers)

d) $\mathbb{N}$ (the set of all natural numbers: $1, 2, 3, \dots$)

e) $\{0\}$ (the set containing only the number 0)

f) $\{1, \frac{1}{4}, \frac{1}{9}, \frac{1}{16}, \frac{1}{25}, \dots\}$ (the set of all reciprocals of squares)

Problem 5. State whether each statement is true or false. (No explanation required)

a) An interior point of S must be a point in S.

b) A boundary point of S must be a point in S.

c) A boundary point of S is never a point in S.

d) Each point in S is either an interior point or a boundary point of S.

e) Each point that is not in S is a boundary point of S.

f) In some cases, the same point can be both an interior point and a boundary point of S.