MATH 2080 F18 Assignment 2

Due Date: Friday October 19th, in lecture

Important:

- Just working on the problem sets is insufficient. You should be doing plenty of exercises from the book and lecture on your own.
- The questions are taken from the fourth edition of Bartle and Sherbert, and the numbering has changed. If you have an earlier edition, please consult with me or with a classmate to make sure that you have the right question. *If you do the wrong question you will not receive credit.*

In the following question from material from Section 2.1, you do NOT need to quote the algebraic properties of the real numbers. However, you still must quote any order properties (P1,P2,P3) and any theorems on order properties from 2.1 that you use.

1. Find the set of x in $\mathbb{R}\backslash\{0\}$ satisfying the inequality

$$-\frac{2}{x} < x - 3.$$

In the following questions on material from Section 2.2 and onwards, you do NOT need to quote any real number or order properties from Section 2.1.

2. 2.2 # 9 (b). (Does not appear in 3rd edition.) The question is: Find all values of x that satisfy the following inequality: $3|x| \leq 2 - x$. Sketch graphs.

3. (a) Use the triangle inequalities to show that if $|x - 1| < 1$ then

$$\frac{1}{|x-4|} < \frac{1}{2}$$

   (b) Use the triangle inequalities and part (a) to find an upper bound for

$$\left|\frac{2x+5}{x-4}\right|.$$

   under the assumption that $|x - 1| < 1$.

4. 2.3 # 8. (3rd edition # 7).

5. Consider the set of real numbers $S = \{x \in \mathbb{Q} : x > 2\} \subseteq \mathbb{R}$.

   (a) Does the infimum of S exist? If so, what is it? If it does not exist, prove it. If it does exist, prove that it is what you claim it is.

   (b) Does the supremum of S exist? If so, what is it? If it does not exist, prove it. If it does exist, prove that it is what you claim it is.

6. Define $A + B = \{a + b : a \in A,\ b \in B\}$. Show that $\inf(A + B) = \inf(A) + \inf(B)$.