MA 511
Problems for Week #8

Your work on these problems will be collected on Wednesday, November 12, in class.

Part A. (November 7).
1. Rudin, Chapter 4, #1.
2. Rudin, Chapter 4, #2.
3. Rudin, Chapter 4, #3.
4. Rudin, Chapter 4, #4.
5. Rudin, Chapter 4, #5.

Part B.
1. The advanced version of the parlor game *Take it to the Limit* is played with two players. The first player is called Epsilon and the second player is called Delta. The game is played with a deck of cards called “Challenges”. Each Challenge card contains three pieces of information: (i) a real function $f(x)$; (ii) a real number $a$; and (iii) another real number $L$.

**Rules of the game.** Each round of *Take It To The Limit* is played in four steps:

1. Delta begins by turning over the top Challenge card. Both players make a mental note of the information on the card: $f(x)$, $a$, and $L$.
2. Epsilon calls out a positive real number and declares that to be the value of $\varepsilon$.
3. Delta calls out another positive real number and declares that to be the value of $\delta$.
4. Epsilon calls out a real number and declares that to be $x$.

**Who wins?** Once the above four “moves” have been made, the winner of the round is decided as follows: *Epsilon* is the winner if all three of the following conditions are satisfied:

| a. $|x - a| < \delta$; |
|-------------------------|
| b. $x$ is not equal to $a$. |
| b. $|f(x) - L| \geq \varepsilon$ |

Otherwise, *Delta is the winner*.

**Questions.** Analyze the game of *Take It To The Limit* to decide who, If anyone, has a winning strategy. Give at least three different examples of possible Challenge cards and in each case, describe a winning strategy for either Epsilon or Delta.