# Main Exercises Week 4

MATH 130: Calculus I, Section 4 Your Name (Print): _____

**Follow the general guidelines for the Main Exercises assignments (the salmon colored handout).** Be sure to **staple** together your pages if you have more than one, and include your **name** at the top. Neatness is appreciated, makes a good first impression, and can earn you a bonus point!!!

**Due:** at the beginning of class on Friday, February 10th

**Remember:** Your write-up should be **your own**. You may discuss these problems with others, but **you should be alone when you write them up**, using only outlines of any group or Intern discussions. EXPLAIN and SHOW YOUR WORK!!! Final answers will not receive full credit without supportive explanations.

1. The **ceiling function** is defined for any real number $x$ as the smallest integer greater than or equal to $x$, and is denoted by $\lceil x \rceil$.

   (a) Draw a graph of the ceiling function $y = \lceil x \rceil$, for $-3 \leq x \leq 3$.

   (b) Evaluate the following limits: (i) $\lim_{x \to -2^-} \lceil x \rceil$, (ii) $\lim_{x \to -1.5} \lceil x \rceil$, (iii) $\lim_{x \to 2^+} \lceil x \rceil$.

   (c) Suppose $a$ is an integer. State the values of (i) $\lim_{x \to a^-} \lceil x \rceil$, (ii) $\lim_{x \to a^+} \lceil x \rceil$.

   (d) For what values of $a$ in the real numbers does $\lim_{x \to a} \lceil x \rceil$ exist? Explain using full sentences.

2. What is the value of $\lim_{x \to -4} \left( \frac{x}{4} + 7 \right)$? Use the $\epsilon$-$\delta$ definition of a limit to prove your assertion. (Refer to the outline on the handout from class on February 6th. Remember that words are important!)