# Math 180 Written Homework
## Assignment #1
Due **Thursday, September 4th** at the beginning of your discussion class.

Directions. You are welcome to work on the following problems with other MATH 180 students, but your solutions must be hand-written and by your own hand. The list of problem solutions is to be submitted to your TA at the beginning of the discussion class listed above. No late homework will be accepted.

1. Write down the names (first and last) of at least five other MATH 180 students. They do not have to be from your lecture or discussion. We suggest getting their contact information too so you can work on future homework assignments with them (and others) as the semester progresses.

2. Evaluate $\lim\limits_{x \to 7} \dfrac{\frac{3}{x} - \frac{3}{7}}{x - 7}$

3. Evaluate $\lim\limits_{x \to -3} \dfrac{x + 3}{\sqrt{84 + x} - 9}$

4. Consider the function
$$f(x) = \begin{cases} \dfrac{|x|}{x}, & \text{if } x \neq 0 \\ 0, & \text{if } x = 0. \end{cases}$$

   (a) Sketch a graph of $f$ on the interval $[-2, 2]$.

   (b) Determine $\lim\limits_{x \to 0} f(x)$. Justify your answer.

   (c) Determine $\lim\limits_{x \to 1} f(x)$. Justify your answer.

5. The *floor* function floor($x$) calculates the largest integer less than or equal to $x$, and the *ceiling* function ceiling($x$) calculates the smallest integer greater than or equal to $x$. Here are some examples:

$$\text{floor}(4.5) = 4$$
$$\text{floor}(-2.8) = -3$$
$$\text{floor}(8) = 8$$
$$\text{ceiling}(6.1) = 7$$
$$\text{ceiling}(-1.99) = -1$$

   Now define a function by
   $$g(x) = \frac{\text{ceiling}(x)}{\text{floor}(x)}.$$

   (a) What is the domain of $g$?

   (b) Graph $g$ on the interval $[-5, 5]$. [You might want to use graph paper for this graph.]

(c) Calculate the following limits or state that they don't exist.

    i. $\lim\limits_{x \to 2} g(x)$

    ii. $\lim\limits_{x \to \frac{5}{2}} g(x)$

    iii. $\lim\limits_{x \to 0^-} g(x)$

(d) Find a value for $c$ such that $\lim\limits_{x \to c} g(x) = \dfrac{3}{2}$.

6. Consider the graphs below, where $t$ represents time and $D$ is distance. Assume the units on each axis are the same for all graphs.

    (a) Which graph represents an object that is slowing down? Explain your answer.

    (b) Which graph represents an object that is traveling at a constant speed? Explain your answer.

    (c) Which graph represents an object whose **velocity** is decreasing the fastest? Explain your answer.

(a)



(b)



(c)



(d)