# MATH 2080 F18 Assignment 4

Due Date: Monday December 3rd, 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.*

1. (a) Find a condition on $|x-3|$ which guarantees that $|x^3-27|<1/100$. Clearly state and prove your claim.
   (b) Find a condition on $|x-3|$ which guarantees that $|x^3-27|<\epsilon$. Clearly state and prove your claim.
2. (a) Show that if $|x-3|<1/2$ then $|x-10|<15/2$ and $|x-2|>1/2$.
   (b) Let
   $$f(x)=\frac{x^2+4}{x-2}$$
   with domain $\mathbb{R}\backslash\{2\}$. Prove that
   $$\lim_{x\to 3}\frac{x^2+4}{x-2}=13$$
   directly from the definition of limit. Do NOT use any limit theorems.
3. Use a sequential argument to show that the following limits do not exist.
   (a)
   $$\lim_{x\to\sqrt{5}}\frac{1}{x^2-5}.$$
   (b)
   $$\lim_{x\to 0}\cos\left(1/x^2\right).$$
4. Section 4.2, Question 11 (d). Give a proof that the limit is zero.
5. Use the algebraic limit theorems to show that
   $$\lim_{x\to 2}\frac{x^2+3x+1}{x^2+2x}=\frac{11}{8}.$$