Homework 1

Math 415 (section 502), Fall 2015

This homework is due on Thursday, September 3. (Turn in your answers to questions 1–3.)

0. *(This problem is not to be turned in.)* Read the syllabus. Bookmark the course webpage on your computer, if you have one. Mark all three exams and their times on your calendar. (a) Where and what time are the regular office hours for this course? (b) If you miss class, where can you find the homework assignments? (c) (How) will grades be "curved"? (d) A student has received the following grades on Homeworks: 9, 10, 8, 8 (out of 10), Quizzes: 7, 10, 9 (out of 10), and Exam 1: 78%. What is this student's current grade in the class?

1. *For each of the following claims, either write "True" (if the claim is true) or write "False" and give an example of functions f and g that violate the claim (if the claim is false).* Let $f : X \to Y$ and $g : Y \to Z$ be functions. Consider the composition $h := g \circ f$:
$$h : X \xrightarrow{f} Y \xrightarrow{g} Z \ .$$

   (a) *Claim 1*: If f and g are both one-to-one, then $h := g \circ f$ is one-to-one.

   (b) *Claim 2*: If f is one-to-one and g is onto, then $h := g \circ f$ is onto.

2. (a) Is the empty set $\emptyset$ a subset of itself? Explain.

   (b) Is the empty set $\emptyset$ a *proper* subset of itself? Explain.

3. List all subset relations (such as $\mathbb{Q} \subseteq \mathbb{C}$) among the following sets: $\mathbb{C}$, $\mathbb{Q}$, $\mathbb{Q}^*$, $\mathbb{R}^*$, $\mathbb{Z}^+$.