Math 4200-001
Week 1 concepts and homework
1.1-1.3
Due Wednesday August 28. at start of class.

1) On the history of complex numbers: There is a Coursera class on complex analysis. The introductory lecture, which is 19 minutes of video with some pauses for you to work, goes into the history of their discovery. Although you first saw the "square root of -1" in the quadratic formula, i was actually introduced to find real number solutions to cubic equations, because in the real world in the 1600's, people were only interested in "real" solutions! And that's why i was called imaginary. (Every cubic has at least one real root, by the intermediate value theorem.) The class is taught by Dr. Petra Bonfert-Taylor and I really like this first lecture. Find the internet link, watch and work along. Nothing to hand in here, but you might decide you want to audit the class as a supplement to ours, and you can do that for free. The Coursera class runs from now until October 14.

Text problems: There are example exercises at the end of each section which I recommend looking over before you try the homework. Odd answers are in the back of the text.

1.1 1b, 2c, 4ab, 6a, 10, 11 (just check the multiplication axioms and the distributive law), 14, 17a.

1.2 1a, 2b, 4, 5, 8 (note, "absolute value" means "modulus"), 11, 14, 19.

1.3 1a, 4b, 5a, 6a, 7a, 8a, 10, 21, 23, 30b. postpone 4b, 7a, 8a, 30b 'til next week. (If you've already completed them and don't want to rip your HW apart just hand them in on Wed)

w1.1 Sketch the following subsets of the complex plane. Use shading and labeling to clearly specify the subset.

a) $\{z \in \mathbb{C} \mid 1 \leq \mathrm{Re}(z) < 3\,, 0 < \mathrm{Im}(z) < 2\}$.

b) $\left\{z \in \mathbb{C} \,\middle|\, |z| \leq 2, 0 < arg(z) < \frac{\pi}{2}\right\}$

c) The image of the sector in b), under the transformation $f(z) = z^3$.

w1.2 Sketch the following subsets of the complex plane, as above.

a) $\left\{z \in \mathbb{C} \,\middle|\, -\frac{\pi}{4} \leq \mathrm{Im}(z) \leq \frac{\pi}{4}\right\}$

b) The image of the strip in a), under the transformation $f(z) = e^z$.

c) The image of the right half plane $\{z \in \mathbb{C} \mid \mathrm{Re}(z) > 0\}$ under the continuous transformation $g(z) = \log(z)$, where $arg(1)$ is chosen to be 2π.