Note: Structure your proofs by stating the full "**Proposition:**" followed by "**Proof:**" as in class, and please start each new proof on a new page. Indent your argument where appropriate for readability and be careful with notation. Keep your work neat and tidy, use complete sentences and correct punctuation, and please staple your assignment. Do not use pages torn from a coil notebook, or if you do, please trim off the ragged edge.

As with any proof, clarity of presentation is as important as solving the problem. Strive to make your proofs clear, concise and precise. Feel free to use results from earlier problems in subsequent ones.

Finally, proofs for many of the problems in this course are likely available online if one looks hard enough, but the point of this course is to learn analysis, and in particular how to write analysis proofs. As such, please resist turning to the internet for help except as a last resort. Instead, discuss solutions among your peers or see me for hints.

Late Assignment Policy: Assignments handed in t days late will incur a penalty of 4^t %. Here t is rounded up to the nearest integer.

Note: As noted on the previous assignment, assume all sequences are sequences of real numbers unless told otherwise.

1. Show $\lim_{n\to\infty} x_n = 0$ if and only if $\lim_{n\to\infty} |x_n| = 0$.
2. Show that $\lim_{n\to\infty} \frac{n^2}{2^n} = 0$.
3. Textbook exercise 2.2.12
4. Textbook exercise 2.2.13 (You may make use of Proposition 2.2.11. Read over the proof of that proposition before you begin.)
5. Suppose $\{x_n\}_{n=1}^{\infty}$ and $\{y_n\}_{n=1}^{\infty}$ are sequences and that $\lim_{n\to\infty} y_n = 0$. Further suppose that for each $k \in \mathbb{N}$, for any $m \geq k$ we have $|x_m - x_k| \leq y_k$. Prove that $\{x_n\}_{n=1}^{\infty}$ is a Cauchy sequence.
6. Suppose $\{x_n\}_{n=1}^{\infty}$ and $\{y_n\}_{n=1}^{\infty}$ are Cauchy sequences. Let $w_n = |x_n - y_n|$. Show using the definition that $\{w_n\}_{n=1}^{\infty}$ is a Cauchy sequence.