Name:

Midterm 2, Math 3210
October 23rd, 2015

You must write in complete sentences and justify all of your work. Do 3 of the 4 problems below. All 3 problems that you do will be equally weighted. Clearly mark in the table below which 3 problems you want graded.

Problem	1	2	3	4
Graded?				
Score				

1. Directly using the definition of a limit show that $\lim_{n\to\infty} \sqrt{n^2+1} - n = 0$.

2. Let a_n be a sequence of positive numbers and assume that the sequence $b_n = a_n/n$ converges to some $b > 0$. Show that there exists a constant $c > 0$ such that $a_n \geq cn$ for all positive integers n.

3. Directly using the definition of a Cauchy sequence show that $a_n = \frac{1}{2n}$ is a Cauchy sequence.

4. Let $f : [0, 1] \to [-1, 0]$ be a continuous function. Show that there exists an $x \in [0, 1]$ such that $f(x) = -x$.

Scratchwork