MATH 202, Fall 2023 **Name:** _____
In class work 13 **Row and Seat**: _____

"Money buys everything except love, personality, freedom, immortality, silence, peace." CARL SANDBURG

In class work **13** has questions **1** through **4** with a total of **10** points. Turn in your work at the end of class *on paper*. This assignment is due *Tuesday October 10 13:20*.

2 1. Use Desmos to graph $y = \sqrt{x^2+1} - x$. Reproduce the graph here. Based on the graph, what is your guess for the numeric value of $\lim_{x\to\infty}\left(\sqrt{x^2+1} - x\right)$?

2 2. Show that the sequence whose formula is $a_k = \sqrt{k^2+1} - k$ converges. Show all of your work.

2 3. Determine if the sequence whose formula is $b_k = k \ln\left(1 + \frac{8}{k}\right)$ converges. If it does, find its limit. As always, show your work.

4. A sequence c is defined recursively by

$$c_n = \begin{cases} 2 & n = 0 \\ 5 & n = 1 \\ 5c_{n-1} - 6c_{n-2} & n = 2, 3, 4, \ldots \end{cases}$$

2 (a) Find the numeric values of c_2, c_3, and c_4.

2 (b) Show that $c_n = 2^n + 3^n$ is a solution to the equation $c_n = 5c_{n-1} - 6c_{n-2}$. To do this, show that $c_n = 5c_{n-1} - 6c_{n-2}$ simplifies to an identity using $c_n = 2^n + 3^n$.