

MATH 202, Fall 2023

In class work 13

Name: _____

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 $\lim_{x \rightarrow \infty} (\sqrt{x^2 + 1} - x)$?

- 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

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

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

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(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 $c_n = 2^n + 3^n$.