

MATH 202, Spring 2024
In class work 17

Name: _____
Row and Seat: _____

"The more I read, the more I acquire, the more certain I am that I know nothing."

VOLTAIRE

In class work **17** has questions **1** through **3** with a total of **5** points. Turn in your work at the end of class *on paper*. This assignment is due *Tuesday 9 April 13:20*.

1. Show that $\lim_{x \rightarrow \infty} \left(1 + \frac{1}{x}\right)^x = e$.

2. Use the *ratio* test to determine if the series $\sum_{k=0}^{\infty} \frac{k^k}{k!}$ converges or diverges.

1 3. Define a sequence s by $s_n = \sum_{k=0}^n \frac{(-1)^k}{\sqrt{k+1}}$. This is a convergent alternating series. Also define $s_\infty = \lim_{n \rightarrow \infty} s_n$.

1 (a) Use Desmos to graph s on the interval $[1, 2, \dots, 150]$. Also use Desmos to find the numeric values of s_{149} and s_{150} . As best you can, reproduce a cartoon of the graph of s .

1 (b) From the theory of convergent alternating series, we know that $s_{149} < s_\infty < s_{150}$. Looking at the graph of s , I would guess that s_∞ is pretty close to the arithmetic average of s_{150} and s_{149} ; that is $s_\infty \approx \frac{s_{150} + s_{149}}{2}$. Find the numeric value of $\frac{s_{150} + s_{149}}{2}$.