MATH 202, Fall 2024 **Name:** _____
In class work 22 **Row and Seat:** _____

"I'm killing time while I wait for life to shower me with meaning and happiness." CALVIN

In class work has questions **1** through **4** with a total of **8** points. Turn in your work at the end of class *on paper*. This assignment is due *Thursday 11 April 13:20*.

On family math night, my friends Bea and Ernest Kind used the ratio test to prove that the power series $\sum_{k=0}^{\infty} \frac{x^k}{k!}$ converges for all real numbers x. In honor of their teenager Emma Kind, Bea and Ernest define a function $E(x) = \sum_{k=0}^{\infty} \frac{x^k}{k!}$, where the domain of E is all real numbers.

2 1. Find the numerical value of $E(0)$; find the numerical value of $E'(0)$.To find these values, go to your happy place: we have $E(x) = 1 + x + \frac{x^2}{2} + \frac{x^3}{6} + \frac{x^4}{24} + \cdots$.

2 2. Bea and Ernest are curious about the graph of the equation $y = E(x)$. They realize that summing to infinity isn't really an option, so they ask their favorite graphing tool to graph $y = \sum_{k=0}^{42} \frac{x^k}{k!}$. They reason that for since the factorial grows very quickly that sum of the first 43 terms will be a good approximation to E, at least for modest values of x. Ask your favorite graphing tool to graph $y = \sum_{k=0}^{42} \frac{x^k}{k!}$. Does the graph look like a function that has a standard name? Reproduce the graph here:

2 3. Find the power series for E'. Change the sum index so that the least sum index is one. Is there a conspiracy between $E(x)$ and $E'(x)$? If so, what is it?

2 4. What is the standard name for the function E?