1. (2.5 pts) Use the limit definition of areas to find an expression for the area under the graph of

$$f = \frac{e^x}{x+1}, 0 \le x \le 4,$$

as a limit. Do not evaluate the limit.

Solution: $\Delta x = \frac{4-0}{n} = \frac{4}{n}$. $x_i = i\frac{4}{n}$.

$$
\begin{aligned}
A & = \lim_{n \to \infty} \left(f\left(x_1\right) + f\left(x_2\right) + \cdots + f\left(x_n\right) \right) \Delta x \\
& = \lim_{n \to \infty} \left(\frac{e^{\frac{4}{n}}}{\frac{4}{n}+1} + \frac{e^{2\left(\frac{4}{n}\right)}}{2\left(\frac{4}{n}\right)+1} + \cdots + \frac{e^{n\left(\frac{4}{n}\right)}}{n\left(\frac{4}{n}\right)+1} \right) \frac{4}{n}
\end{aligned}
$$

or

$$A = \lim_{n \to \infty} \sum_{i=1}^{n} \frac{e^{i\left(\frac{4}{n}\right)}}{i\left(\frac{4}{n}\right)+1}.$$

$\square$

2. (2.5 pts) Find the derivative $\frac{d}{dx} h\left(x\right)$ where

$$h\left(x\right) = \int_1^{x^2} \frac{\sin t}{t^3} dt$$

Solution:

$$h'\left(x\right) = \frac{\sin\left(x^2\right)}{\left(x^2\right)^3} \left(2x\right).$$

$\square$