

**Exercise 1.** Write code to evaluate the following mathematical series (use FOR-loops)

- For  $K=10$ , at  $x = e$

$$\sinh(x) \approx \sum_{k=0}^K \underbrace{\left[ \frac{x^{2k+1}}{(2k+1)!} \right]}_{f_k(x)};$$

- For  $K = 100$ , at  $x = 0.5$

$$\operatorname{arcsinh}(x) \approx \sum_{k=0}^K \underbrace{\left[ \frac{(-1)^k (2k)! x^{2k+1}}{2^{2k} (k!)^2 (2k+1)} \right]}_{f_k(x)};$$

- For  $K = 1000$ , at  $x = 1/3$

$$\sqrt{\frac{1 - \sqrt{1-x}}{x}} \approx \sum_{k=0}^K \underbrace{\left[ \frac{(4k)!}{2^{4k} \sqrt{2} (2k)! (2k+1)!} x^k \right]}_{f_k(x)}.$$

For each function, sequentially (within the loop) construct the following three lists

1. A list `k_list` of the values  $k = 0, 1, 2, \dots, K$
2. A list `f_list` of corresponding terms  $f_k(x)$
3. A list `s_list` of partial sums  $s_{0 \rightsquigarrow k}(x)$

$$s_{0 \rightsquigarrow k}(x) = f_{k=0}(x) + f_{k=1}(x) + \dots + f_{k=k}(x)$$

Complete the assignment by merging the three list in a single (nested) list in way of your choice.