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## Scientific Computing 1 3rd worksheet for online events 12/03/2020

"When reading the code in about six months and asking yourself: who wrote this crap? The answer should not be: YOU!"

Basically that means:

- Try to always use meaningful names for functions, variables, ....
- Write documentation wherever necessary.
- Use indentation to increase readability of the code.
- Add a short statement describing its purpose and basic behavior to each function.
- ...

## Exercise 1:

Determine the absolute and the relative condition numbers of

$$a.) \quad f(x) = \sin(x),$$

**b.)** 
$$f(x) = \arctan(x)$$
,

c.) 
$$f(x) = \sqrt{x \exp(x)}, \quad x > 0.$$

Which values of x will lead to high condition numbers?

## Exercise 2:

Reformulate the following expressions to avoid cancellation:

a.) 
$$\sqrt{1+x} - 1$$
,  $x \approx 0$   
b.)  $\frac{1-\cos x}{\sin x}$ ,  $x \approx 0$   
c.)  $\frac{1}{1+2x} - \frac{1-x}{1+x}$ ,  $x \approx 0$ 

## Exercise 3:

Determine the absolute and the relative error of 0.5403023059 and  $\pi$  in

- a.)  $\mathbb{M}(10, 3, -2, 2)$
- **b.)**  $\mathbb{M}(2, 3, -2, 3)$
- c.)  $\mathbb{M}(2, 5, -2, 2)$
- d.) IEEE 754 half precision