

Worksheet 1

Problem 1: Forward/backward error

Consider the function $f(x) = 1/x$, which we approximate by its Taylor series about 1:

$$f(x) \approx 1 - (x - 1) + \dots$$

(a) What is the forward error of using this approximation at $x = 0.5$?

(b) What is the backward error of using this approximation at $x = 0.5$?

Problem 2: Condition number

(a) Determine an approximate global upper bound on the condition number of evaluating $\sin(x)$ on the interval $[0, \pi/2]$.

(b) Is the condition number on the interval $[10^4\pi, 10^4\pi + \pi/2]$ larger or smaller than in (a)?

Problem 3: Condition number, again

Which of the operations $+$, $-$, \times , $/$ are, loosely, always ‘well-conditioned’?