

MAT128A: Numerical Analysis, Section 2
Homework for the week of October 1

1. What is the condition number of evaluation of the function

$$f(x) = \exp(\cos(x))$$

at the point x ?

2. Suppose that f and g are continuously differentiable functions $\mathbb{R} \rightarrow \mathbb{R}$. Let $\kappa_f(x)$ denote the condition number of evaluation of the function f at x . Find an expression for the condition number of evaluation of the function $h(x) = f(g(x))$ at x in terms of $\kappa_f(g(x))$ and $g'(x)$.
3. Suppose that f and g are continuously differentiable functions $\mathbb{R} \rightarrow \mathbb{R}$. Let $\kappa_f(x)$ denote the condition number of evaluation of the function f at x , and let $\kappa_g(x)$ denote the condition number of evaluation of the function g at x . Find an expression for the condition number of evaluation of the function $h(x) = f(x) \cdot g(x)$ at x in terms of $\kappa_f(x)$ and $\kappa_g(x)$.
4. Suppose that f and g are continuously differentiable functions $\mathbb{R} \rightarrow \mathbb{R}$. Let $\kappa_f(x)$ denote the condition number of evaluation of the function f at x , and let $\kappa_g(x)$ denote the condition number of evaluation of the function g at x . Find an expression for the condition number of evaluation of the function $h(x) = f(x)/g(x)$ at x in terms of $\kappa_f(x)$ and $\kappa_g(x)$.
5. What is the Fourier series of the function $f(x) = x$?
6. What is the Fourier series of the function $f(x) = |x|$?

(Hint: you can easily find an antiderivative of $x \exp(inx)$ using integration by parts).