

Assume $f(x)$ is piecewise smooth
Can be discontin.

(1) Integration of Fourier Series term-by-term

ANS: Yes

(2) Differentiation of Fourier Series Term by Term

ANS: Maybe

$$f(x) = \begin{cases} 1 & 0 < x < 1 \\ 2+x & 1 < x < 2 \\ x^2 & 2 < x < 3 \end{cases}$$

↑
Each has a cont. Der.