(1) Theorem: f Piecewise Smooth

$f(x)$ is cont (no jumps)

$f(-L) = f(L)$

$\Rightarrow \frac{d}{dx}\left(\begin{matrix}\text{Fourier Series}\\ \text{Term-by-Term}\end{matrix}\right) = \frac{d}{dx} f(x)$

(2) Theorem: f is P. S.

$f(x)$ cont (no jumps)

$f'(x)$ is piecewise smooth (no corners)

$\Rightarrow \frac{d}{dx} f(x) =$ Term-by-Term $\frac{d}{dx}$ of Fourier Cosine Series

(3) Theorem

$\longleftarrow$ assume

$\longleftarrow$ assume $f(0)=0, f(L)=0$

$\longrightarrow$ True for Sine Series