1. $\frac{d}{dt}[f_1(t)*f_2(t)] = \frac{d}{dt}\int_{-\infty}^{\infty} f_1(t-\tau)f_2(\tau)\,d\tau$ ①

由于 $f_1(t)$ 与 $f_2(t)$ 在R上均连续可导，故 ①式等于下式：

$$① = \int_{-\infty}^{\infty}\left[\frac{d}{dt}[f_1(t-\tau)f_2(\tau)]\right]d\tau$$

$$= \int_{-\infty}^{\infty}\frac{d}{dt}[f_1(t-\tau)]\cdot f_2(\tau)\,d\tau = \frac{d}{dt}f_1(t) * f_2(t).$$

另一等号由 $\frac{d}{dt}[f_1(t)*f_2(t)] = \frac{d}{dt}[f_2(t)*f_1(t)]$，做类似推理可知成立.

2. $\int_{-\infty}^{t} f_1*f_2(\lambda)\,d\lambda = \int_{-\infty}^{t}\left[\int_{-\infty}^{\infty} f_1(\lambda-\tau)f_2(\tau)\,d\tau\right]d\lambda$ ①

由 f_1 与 f_2 在R上均连续可导. 故有

$$① = \int_{-\infty}^{\infty}\left[\int_{-\infty}^{t} f_1(\lambda-\tau)f_2(\tau)\,d\lambda\right]d\tau = \int_{-\infty}^{\infty}\left[\int_{-\infty}^{t} f_1(\lambda-\tau)\,d\lambda\right]f_2(\tau)\,d\tau$$

$$= \int_{-\infty}^{\infty}\left[\int_{-\infty}^{t-\tau} f_1(m)\,dm\right]f_2(\tau)\,d\tau = \left(\int_{-\infty}^{\infty} f_1(\lambda)\,d\lambda\right) * f_2(t)$$

另一等号由 $\int_{-\infty}^{t} f_1*f_2(\lambda)\,d\lambda = \int_{-\infty}^{t} f_2*f_1(\lambda)\,d\lambda$，做类拟推理可知成立