3(c)

$$[u(t) * h(t)] = \int_{-\infty}^{\infty} u(\tau)\, h(t-\tau)\, d\tau.$$

$$C_1 \equiv [u(t) * h(t)] * g(t) = \int_{-\infty}^{\infty} \left[\int_{-\infty}^{\infty} u(\mu)\, h(\tau-\mu)\, d\mu \right] g(t-\tau)\, d\tau$$

$$C_1 = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} u(\mu)\, h(\tau-\mu)\, g(t-\tau)\, d\mu\, d\tau$$

Let $\tau_2 = \tau - \mu$, then $C_1 = \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} u(\mu)\, h(\tau_2)\, g(t-\tau_2-\mu)\, d\mu\, d\tau_2$

$$[h(t) * g(t)] = \int_{-\infty}^{\infty} h(\tau)\, g(t-\tau)\, d\tau$$

$$C_2 \equiv u(t) * [h(t) * g(t)] = \int_{-\infty}^{\infty} u(\mu) \left[\int_{-\infty}^{\infty} h(\tau)\, g(t-\mu-\tau)\, d\tau \right] d\mu$$

$$= \int_{-\infty}^{\infty} \int_{-\infty}^{\infty} u(\mu)\, h(\tau)\, g(t-\mu-\tau)\, d\tau\, d\mu$$

$$= C_1$$