

$$\partial^\mu \partial_\mu D_{\text{ret adv}}(x) = \delta^4(x)$$

$$D_{\text{ret adv}}(x) = \int d^4k \tilde{D}_{\text{ret adv}}(k) e^{i k \cdot x}$$

$$-k^\mu k_\mu \tilde{D}_{\text{ret adv}}(k) = \frac{1}{(2\pi)^4}$$

$$\tilde{D}_{\text{ret}}(k) = \frac{-1}{(2\pi)^4} \cdot \frac{1}{k^\mu k_\mu} + \frac{1}{32\pi i} \left[\frac{\delta(k^4 - |\mathbf{k}|) - \delta(k^4 + |\mathbf{k}|)}{|\mathbf{k}|} \right]$$

$$\tilde{D}_{\text{adv}}(k) = \frac{-1}{(2\pi)^4} \cdot \frac{1}{k^\mu k_\mu} - \frac{1}{32\pi i} \left[\frac{\delta(k^4 - |\mathbf{k}|) - \delta(k^4 + |\mathbf{k}|)}{|\mathbf{k}|} \right]$$