2017 / 1 / 11 (수) 정훈.

$$\int d^3k\, e^{i\vec{k}\cdot\vec{r}} = \int_0^{k_F} k^2 dk\, d\Omega\, e^{ikr\cos\theta}$$

$$= 2\pi \int_0^{k_F} k^2 dk \left[ \frac{e^{ikr\cos\theta}}{ikr} \right]_{\cos\theta=-1}^{\cos\theta=1}$$

$$= 2\pi \int_0^{k_F} k^2 dk \left[ \frac{e^{ikr} - e^{-ikr}}{ikr} \right]$$

$$= 4\pi \int_0^{k_F} \frac{k \sin kr}{r}\, dk$$

$$= 4\pi \left[ \frac{-k\cos kr}{r^2} \right]_0^{k_F} + 4\pi \int_0^{k_F} \frac{\cos kr}{r^2}\, dk$$

$$= -\frac{4\pi k_F \cos k_F r}{r^2} + 4\pi \left[ \frac{\sin kr}{r^3} \right]_0^{k_F}$$

$$= \frac{4\pi}{r^3} \left( \sin k_F r - k_F r \cos k_F r \right) //$$