PROBLEM (Lecture 21).

Calculate average raduis ρ of a Cooper pair. Answer: $\rho = const(\hbar v_F/|E|)$.
Hint: calculate average square radius,

$$\rho^2 = \frac{< \psi|\rho^2|\psi >}{< \psi|\psi >},$$

using wave function $\psi(\mathbf{p}) = const/(2E_{\mathbf{p}} + |E|)$; use momentum representation, $\rho \to i\hbar(\partial/\partial\mathbf{p})$.)