

Homework #4

Due 10/25/2001

1. Given that $g(k) = \frac{N}{k^2 + \alpha^2}$, calculate the form of $f(x)$ which is the fourier transform of g . Again, plot the two functions and show that $\Delta k \Delta x > 1$, independent of the choice of α .
2. Nuclei, typically of size 10^{-12} cm, frequently emit electrons, with energies of 1~10 MeV. Use the uncertainty principle $\Delta x \cdot \Delta p \geq \frac{\hbar}{2}$ to show that electrons of energy 1MeV could not be contained in the nucleus before the decay.
3. In the last class, I have shown how to find a 2x2 matrix (operator) X if we know $X|\alpha\rangle$ and $\langle\alpha|X$ for all $|\alpha\rangle$. Please do the similar thing for a 3x3 matrix (operator) Y .