PHYS 2210 Quantum Physics I Spring 2020

Homework #4

Due 02/14/2020

Problems 2.18, 2.22, 2.30, 2.31, 2.33, 2.34, 2.35.

Additional problem: Given the Gaussian wavenumber distribution of a wave package $A(k) = (\frac{2}{\pi})^{\frac{1}{4}}\sqrt{\sigma}e^{-\sigma^2(k-k_o)^2}$. Show that $\Psi(x) = \frac{1}{\sqrt{2\pi}}\int_{-\infty}^{+\infty} A(k)e^{ikx}dk =$

$\frac{1}{\sqrt{2\pi}}(\frac{2}{\pi})^{\frac{1}{4}}\sqrt{\sigma}\int_{-\infty}^{+\infty} e^{-\left[\sigma k-\left(\sigma k_o+\frac{ix}{2\sigma}\right)\right]^2+ik_0x-\frac{x^2}{4\sigma^2}}dk.$

Useful formula: $f(y) = ay^2 + by + c = (\sqrt{a}y + \frac{b}{2\sqrt{a}})^2 - \frac{b^2}{4a} + c$