Homework 02

Problem 1: Sakurai 1.28 (b), (c)

Problem 2: Sakurai 1.33

Problem 3

With $|\alpha\rangle$ a Gaussian wavepacket, $\langle x|\alpha\rangle = \frac{1}{\pi^{1/4}\sqrt{\alpha}} e^{ikx - \frac{x^2}{2d^2}}$, proof $\langle p|\alpha\rangle = \sqrt{\frac{d}{\hbar\sqrt{\pi}}} e^{-\frac{(p-\hbar k)^2 d^2}{2\hbar^2}}$. Hint: $\int_{-\infty}^{+\infty} dx\ e^{-\frac{(x-\xi)^2}{d^2}} = d\sqrt{\pi}$, ξ is a complex number