

2.4 Let $\psi(x)$ be a properly normalised wavefunction and Q an operator on wavefunctions. Let $\{q_r\}$ be the spectrum of Q and $\{u_r(x)\}$ be the corresponding correctly normalised eigenfunctions. Write down an expression for the probability that a measurement of Q will yield the value q_r . Show that $\sum_r P(q_r|\psi) = 1$. Show further that the expectation of Q is $\langle Q \rangle \equiv \int_{-\infty}^{\infty} \psi^* \hat{Q} \psi \, dx$.¹