Question 15535

Wave function is an element of vector space over complex field (is and element of Hilbert space, where the inner product is given by $<\psi_1|\psi_2> = \int \psi_1^* \psi_2 \, dq$, where q denote coordinates). Wave function represents the state of the system, which it describes. A self-adjoint operator with real eigenvalues which represents some physical quantity (for example, energy, linear momentum etc) acts on a wave function, and gives the value of that quantity in a given state: $A \psi_n = A_n \psi_n$.

For a given state, $|\psi_n|^2$ is the probability density. For example, if ψ_n is a function of coordinates, the probability for an object which it describes being found between q and $q + dq$ is $\psi_n(q) \, dq$. The wave function as a probability density must be normalized: $\int |\psi|^2 \, dq = 1$.