

Fig. 4.1. Space is divided into region I, $x < 0$, and region II, $x > 0$. There is a constant potential in region II, $V = V_0$, whereas in region I there is no potential, $V = 0$.

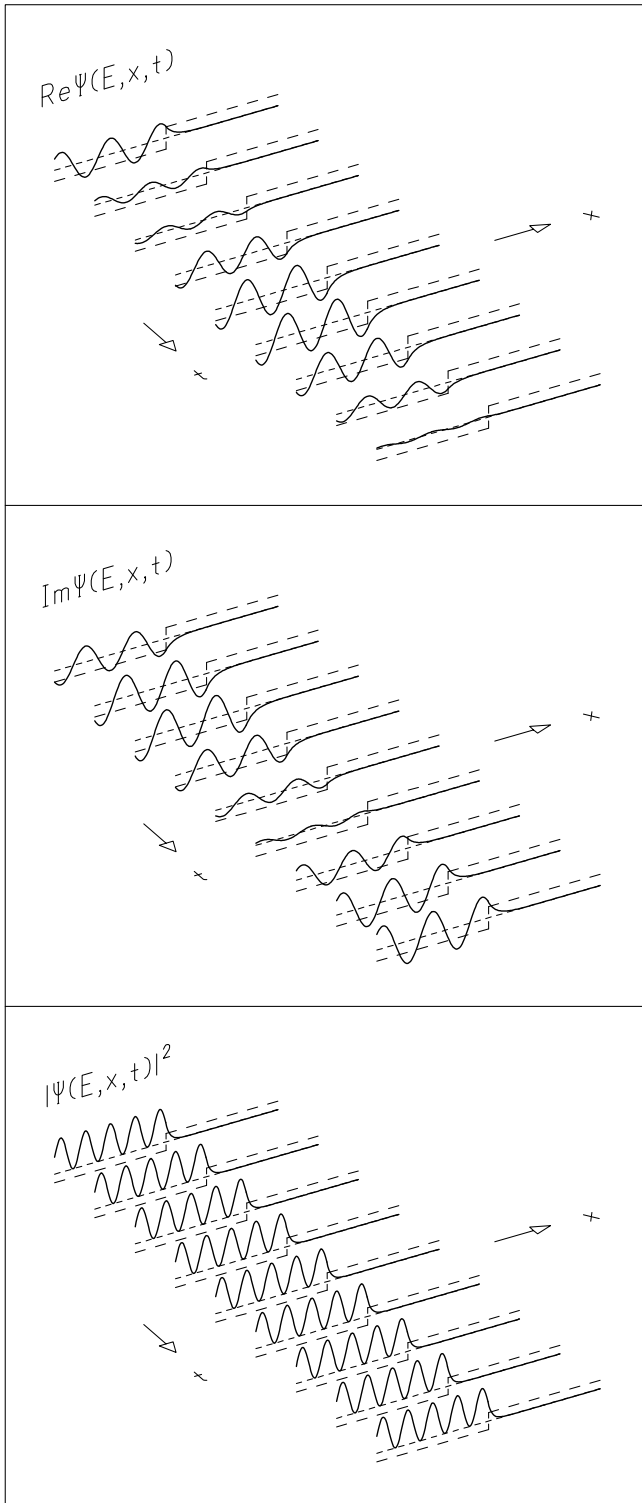


Fig. 4.2. Time developments of the real part, the imaginary part, and the intensity of a harmonic wave of energy $E < V_0$ falling onto a potential step of height V_0 . The form of the potential $V(x)$ is indicated by the line made up of long dashes, the energy of the wave by the short-dash horizontal line, which also serves as zero line for the functions plotted. To the left of the potential step is a standing-wave pattern, as is apparent from the time-independent position of the nodes or zeros of the functions $\text{Re } \psi(x, t)$ and $\text{Im } \psi(x, t)$. The absolute square $|\psi(x, t)|^2$ is time independent.

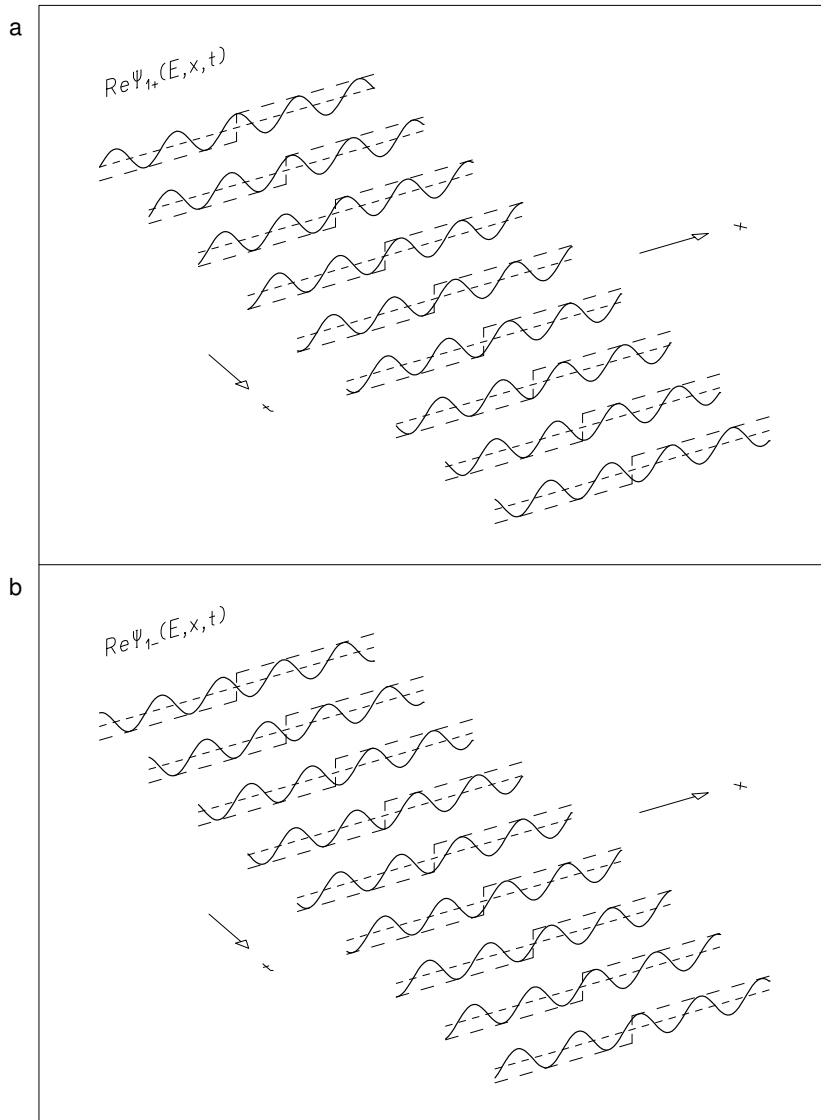


Fig. 4.3. Time developments of the real parts of (a) the incoming constituent wave and (b) the reflected constituent wave making up the harmonic wave of Figure 4.2.

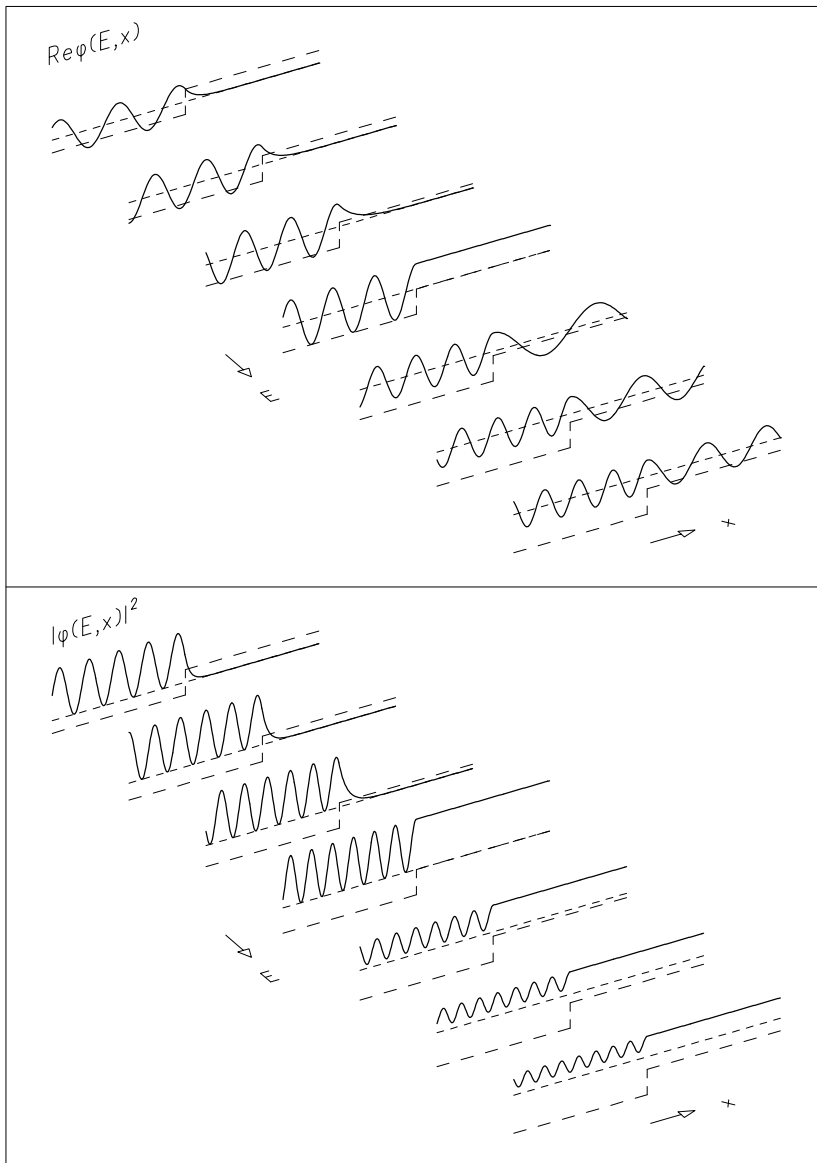


Fig. 4.4. Energy dependence of stationary solutions for waves incident on a potential step of height $V_0 > 0$. Shown are the real part of the wave function and the intensity. Small energies are in the background.

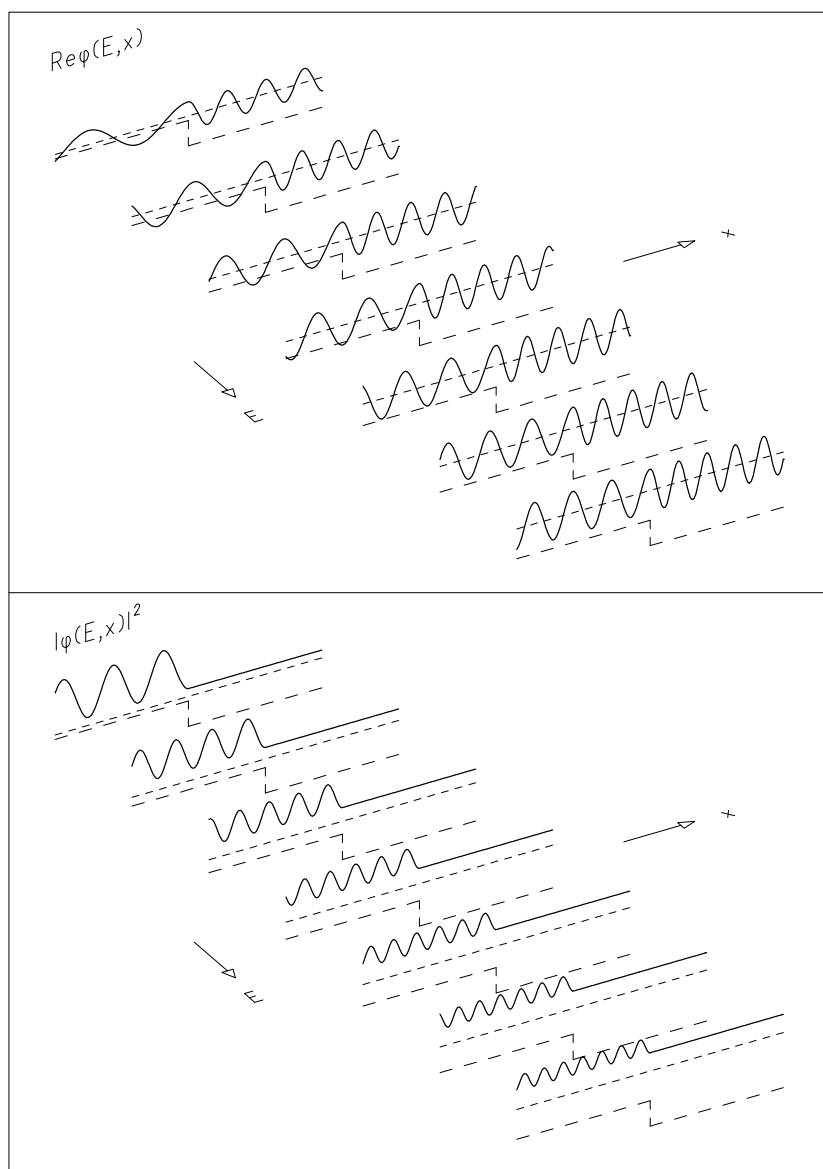


Fig. 4.5. Energy dependence of the real part and of the intensity of stationary solutions for harmonic waves incident on a potential step of height $V_0 < 0$.

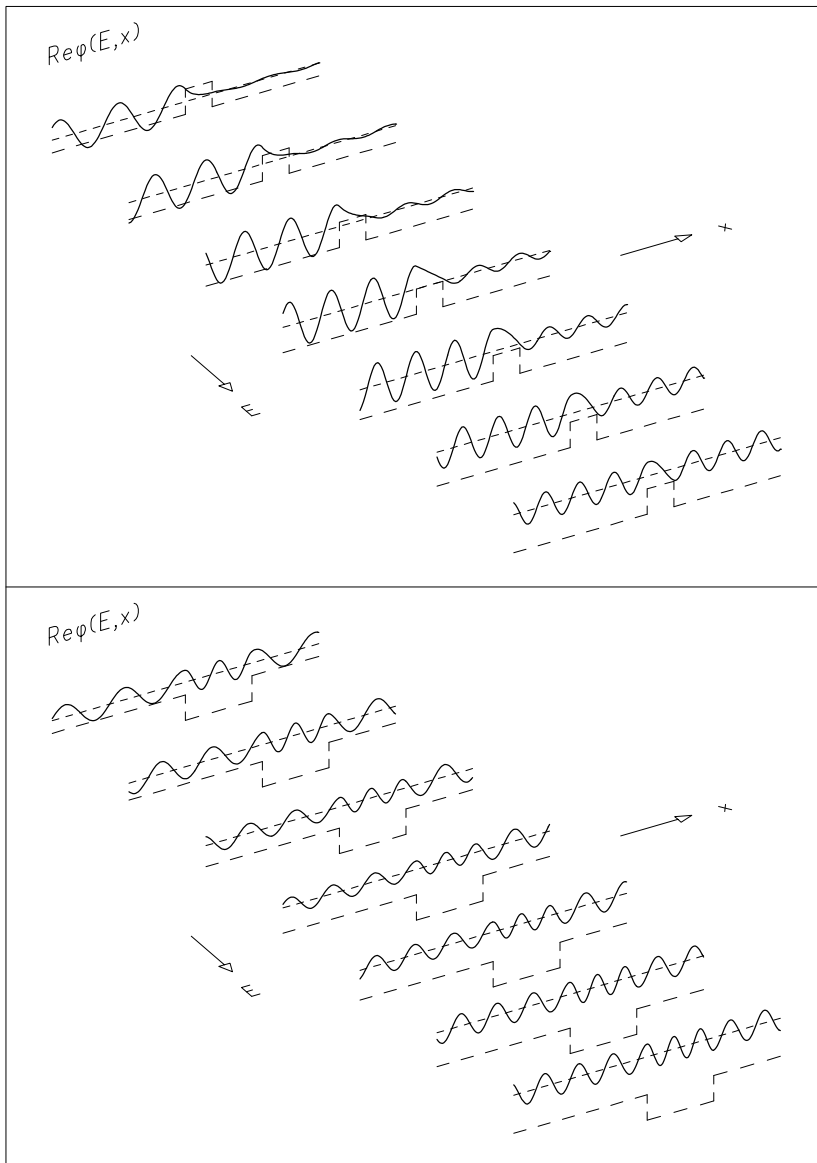


Fig. 4.6. Energy dependence of stationary solutions for waves incident onto a positive potential barrier (top), $V_0 > 0$, and a negative potential barrier (bottom), $V_0 < 0$, which is also called a square-well potential. The real part of the wave function is shown.

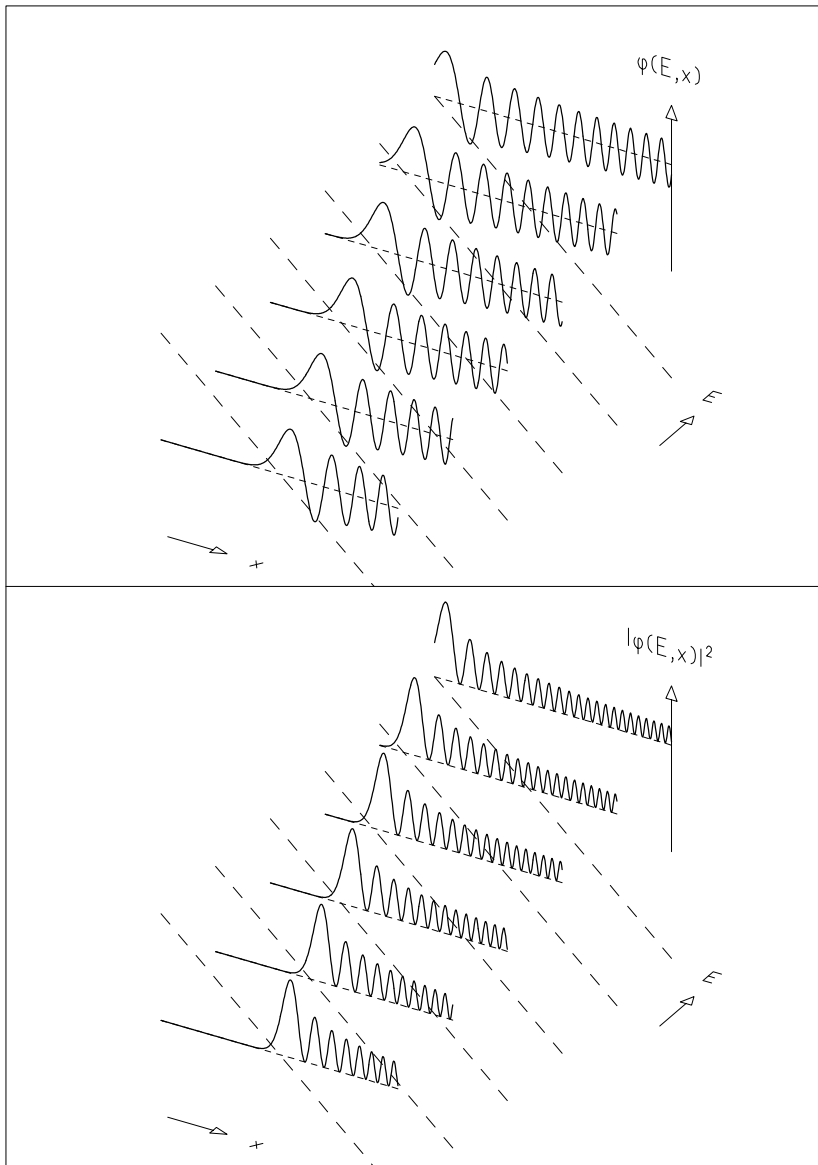


Fig. 4.7. Stationary-solution wave function $\varphi(x)$ (top) and its absolute square (bottom) in a linear potential for various values of the total energy E . The potential is indicated by the long-dash broken line, the total energy E by the short-dash broken line. They intersect at the classical turning point x_T . The short-dash broken line also serves as the zero line for the functions $\varphi(x)$ and $|\varphi(x)|^2$.

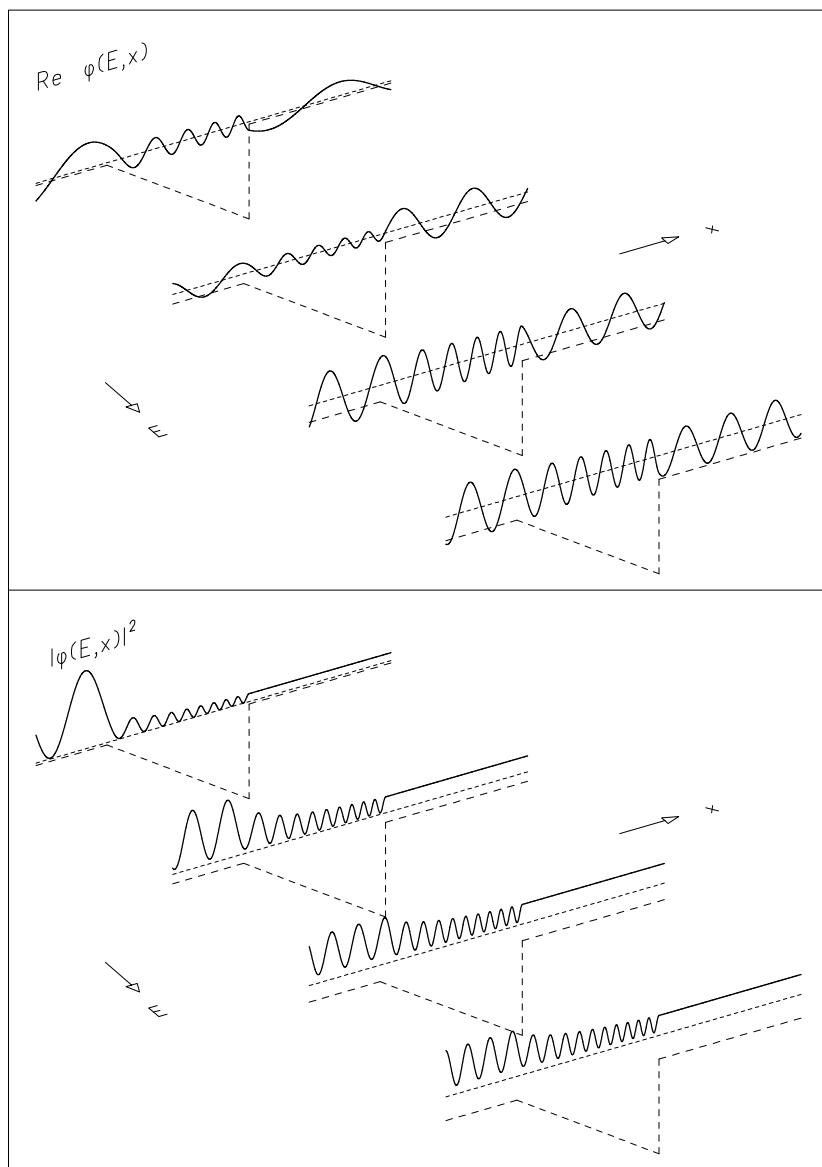


Fig. 4.8. Energy dependence of the stationary wave functions $\varphi(x)$ for a piecewise linear potential. In the region where the potential decreases linearly with x the wavelength is observed to fall, since kinetic energy and momentum rise.

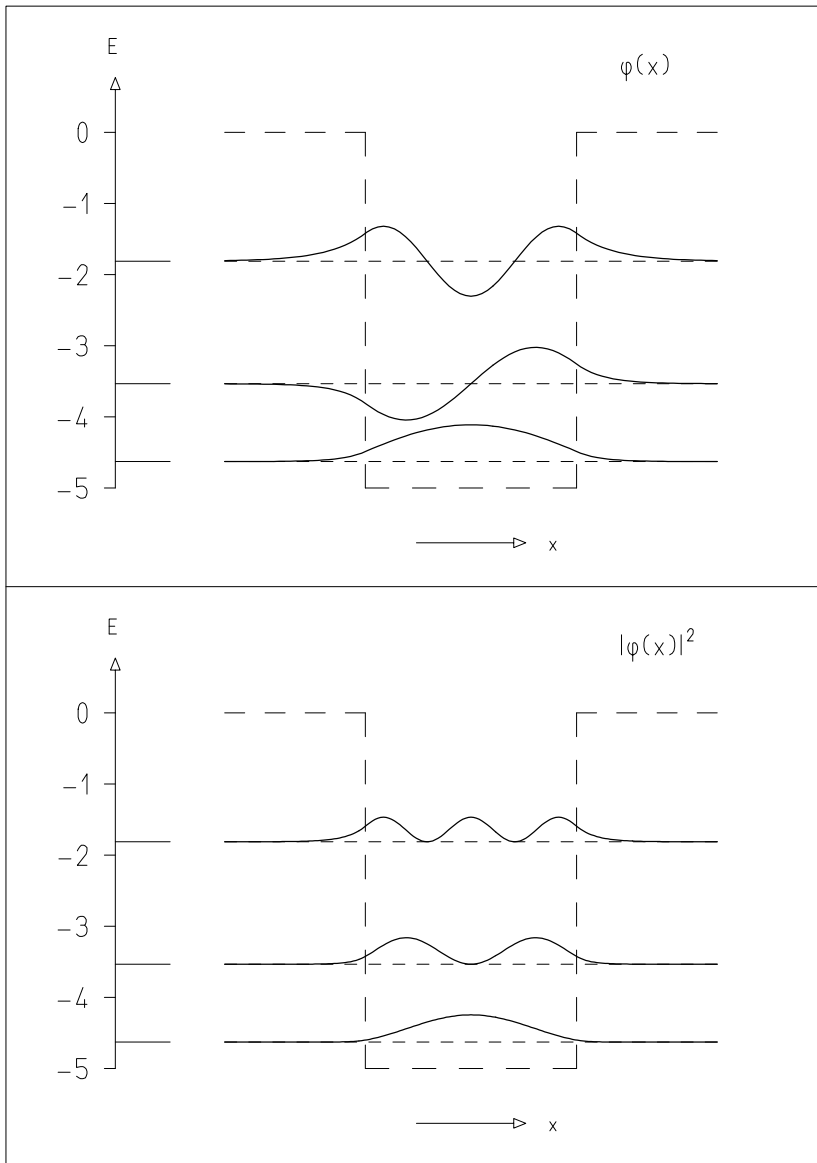


Fig. 4.9. Wave functions (top) and probability densities (bottom) of the bound states in a square-well potential. On the left side of the picture an energy scale is shown with marks for the bound-state energies ($n = 1, 2, 3$). The form of the potential $V(x)$ is indicated by the long-dash line, the energy E_n of the bound states by the horizontal short-dash lines. The horizontal dashed lines also serve as zero lines for the functions shown.

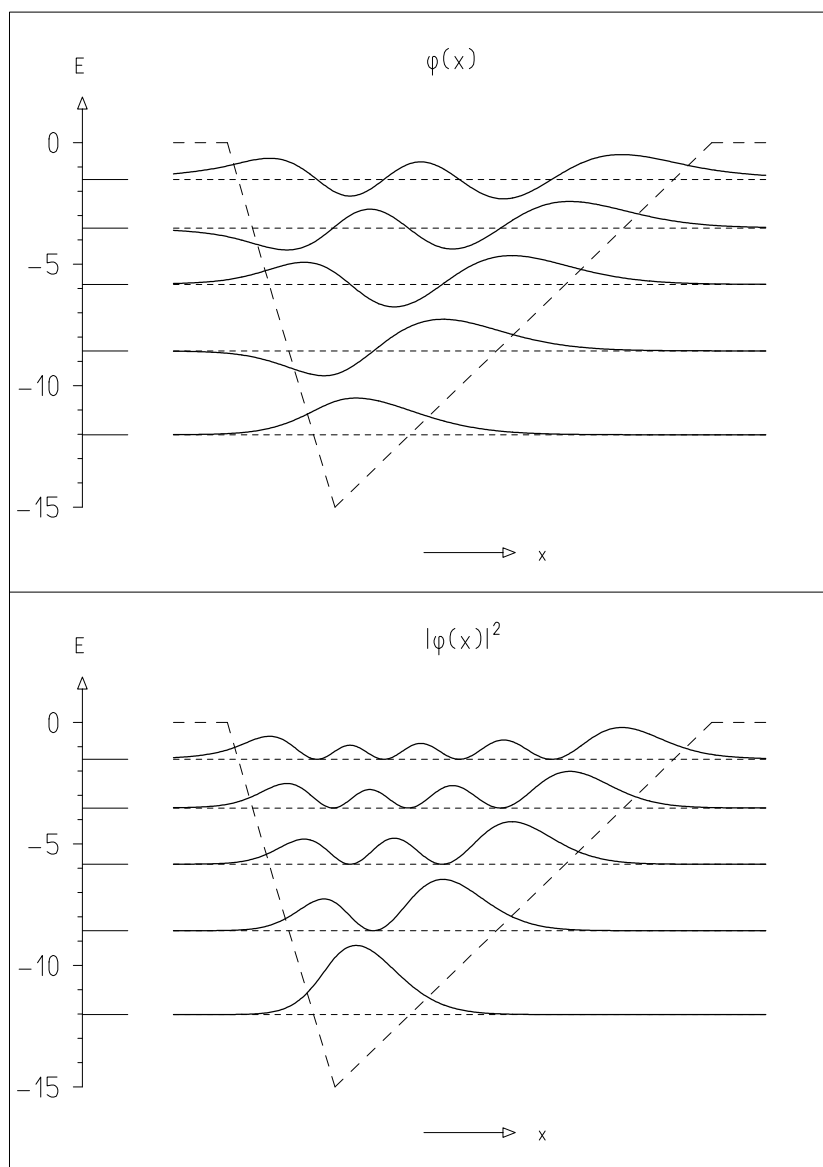


Fig. 4.10. Wave functions (top) and probability densities (bottom) of the stationary bound states in a piecewise linear potential.