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Quantum reflection in the linearly downward potential

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In this work, the motion of a particle in one dimension, under the influence of the potential well that is modeled as the linear downward of length L with a finite depth $|V_0|$, is studied within the context of the non-relativistic quantum mechanics. The attention is paid on the paradoxical phenomenon of the reflection of a particle that is in contrast between classical and quantum physics. Classically, the reflection effect occurs only at a potential
barrier. To demonstrate such counterintuitive phenomenon, the Schrödinger equation is solved to obtain the reflection coefficient in the scattering state by considering an incident particle with an energy $E > 0$, that is represented by a monochromatic plane wave, propagates freely from left to right, pass through the potential well. The continuity conditions at boundaries give the desired result that is expressed in terms of the Airy functions which
depends on the incident energy E, the strength $|V_0|$ and the range L of the well. The value of the reflection coefficient R lies in the interval $0 \leq R < 1$, and its behavior is the decreasing function with respect to the range L.

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