PH 105 – Quantum Mechanics

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69)  
In the region where (V=V0>0)  
ψ(x) = Aekxk=[2m(V0-E)/ħ2]1/2

(a)| ψ(0)|2/| ψ(x0)|2 = 1/e  
-2k x0 = -1

x0 = 1/2k = ħ/[8m(V0-E)]1/2  
**x0 = ħ/[8m(V0-E)]1/2**

(b)  
Δp. Δx ~ ħ  
Δp= ħ/ Δx = [8m(V0-E)]1/2

ΔE = Δp2/2m = 4(V0-E)  
E̕ = E ± ΔE  
**E̕ = V0 + 3(V0-E) > V0**  
Due to the uncertainty in energy, E may exceed V0 . This explains why the particle is able to penetrate the potential barrier even though it is classically forbidden.