UNIVERSITY OF CALIFORNIA, SANTA BARBARA
Department of Physics

Physics 115A
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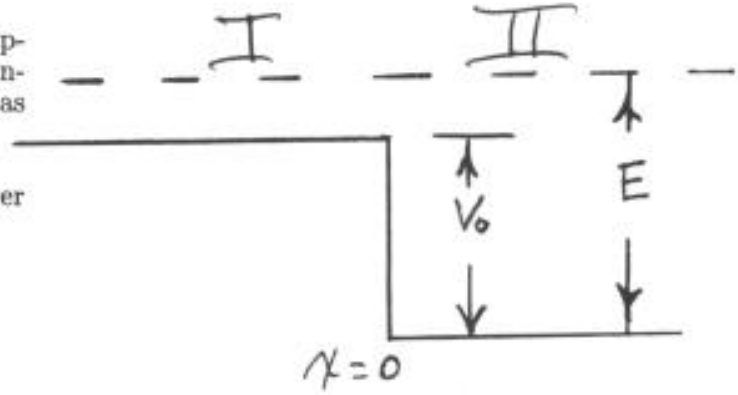
FINAL EXAM (con't.)

3. A particle of mass m and energy E approaches, from the left, a potential downstep of height V_0 ($V_0 < E$) at $x = 0$ as shown.



(a) Give the time independent Schrödinger equation for $x > 0$.

$$-\frac{\hbar^2}{2m}\frac{d^2u}{dx^2} = Eu$$

or $$\frac{d^2u}{dx^2} = -\frac{2m}{\hbar^2}Eu$$

(b) What is the wavelength λ of the particle for $x > 0$?

$u = e^{ikx}$ or e^{-ikx} are solutions of (a) with

$$-k^2 = -\frac{2mE}{\hbar^2}$$

so $k = \sqrt{\frac{2mE}{\hbar^2}}$, $\lambda = \frac{2\pi}{k} = \frac{2\pi}{\sqrt{\frac{2mE}{\hbar^2}}}$