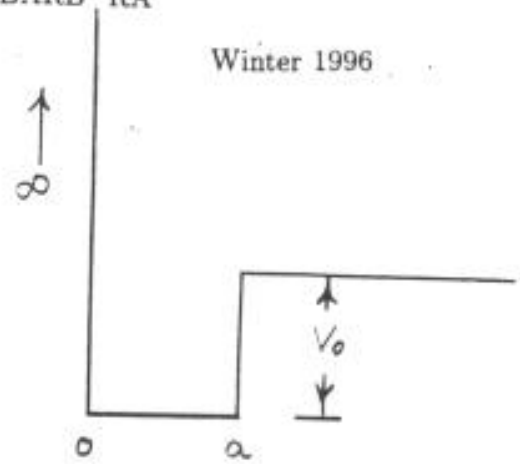
UNIVERSITY OF CALIFORNIA, SANTA BARB ' RA
Department of Physics

Physics 115A
Prof. Rollin J. Morrison

Winter 1996

Midterm (continued)



3. (50 points) Consider the bound states of a particle of mass m in the one-dimensional potential given in the three regions:

I	$V = \infty$	$x < 0$
II	$V = 0$	$0 < x < a$
III	$V = V_0$	$x > a$

(a) Write an expression for the time independent Schrödinger equation in region III.

$$-\frac{\hbar^2}{2m}\frac{\partial^2\psi}{\partial x^2} + V_0\psi = E\psi$$

(b) For bound states ($E < V_0$) write a general expression for $\psi_{\text{III}}(x)$ in region III which satisfies the necessary conditions as $x \to \infty$.

$$\psi_{III}(x) = Ae^{-\rho x}, \quad \rho = \sqrt{\frac{2m}{\hbar^2}(V_0 - E)}$$

This is a solution of the equation of part (a).