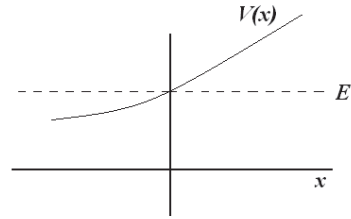


Problem Set #6

19. A particle of mass m and energy E moves in one dimension under the influence of the potential $V(x)$. If $V(0) = E$ and the particle's wavefunction has the approximate form:

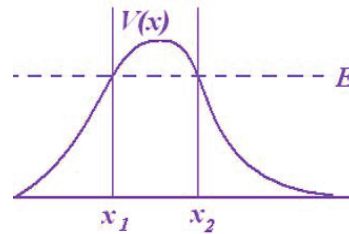


$$\psi(x) = \frac{C}{[E - V(x)]^{\frac{1}{4}}} \cos \left\{ \frac{1}{\hbar} \int_x^0 \sqrt{2m(E - V(x'))} dx' + \frac{\pi}{4} \right\}$$

for x large and negative. Find $\psi(x)$ for x large and positive assuming the WKB approximation to be valid both large x and for x sufficiently small to permit a first order Taylor approximation to $V(x)$ about $x = 0$.

20. A particle with energy E and mass m is incident from the left on the potential barrier $V(x)$.

- (a) What conditions as $x \rightarrow \pm\infty$ should be imposed on the energy eigenfunction $\psi_E(x)$ appropriate to this problem?



- (b) Use the WKB approximation to obtain an expression for the probability of finding the particle to the right of the barrier at a much later time t for the case that E is less than the maximum value of V . Be careful to use only the information that is available from the known asymptotic form of the solution, avoiding the addition of elements of the solution which are not known without a more complete solution.