PH 451/551 **Winter 2026**

Worksheet #3

Friday, January 9, 2026

Name:

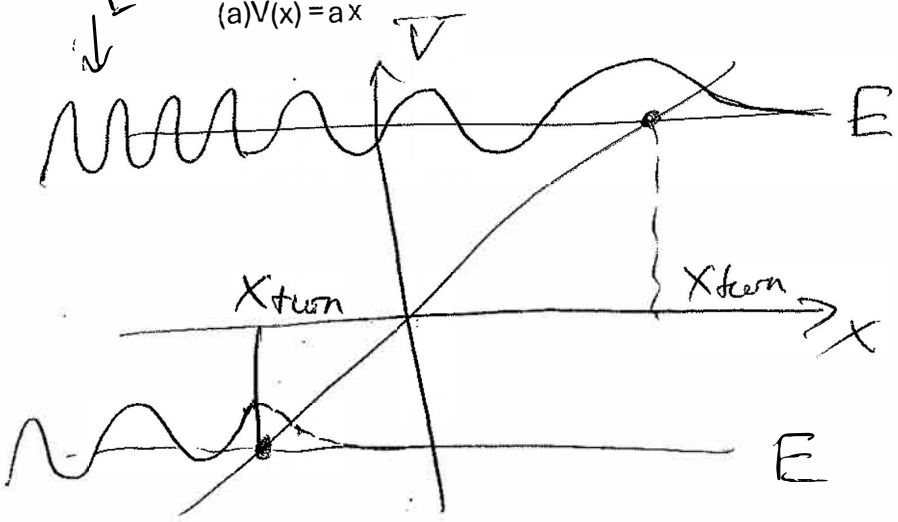
Questions (10 pts):

Consider a particle with the potential energy V(x) given below.

1. Sketch V(x) and choose two values of the total energy E for which you will be analyzing the particle motion.
2. Label the turning point(s). Sketch the wavefunction depending on the region. Be as specific as you can in terms of the spatial frequency (period) in case of the oscillatory wave function and in terms of decay length in case of decaying wave function. (For example, the sketch should clearly show qualitative differences in the period depending on the E-V(x).)
3. Is the energy spectrum discrete or continuous?

larger E-V

(a) V(x) = a x



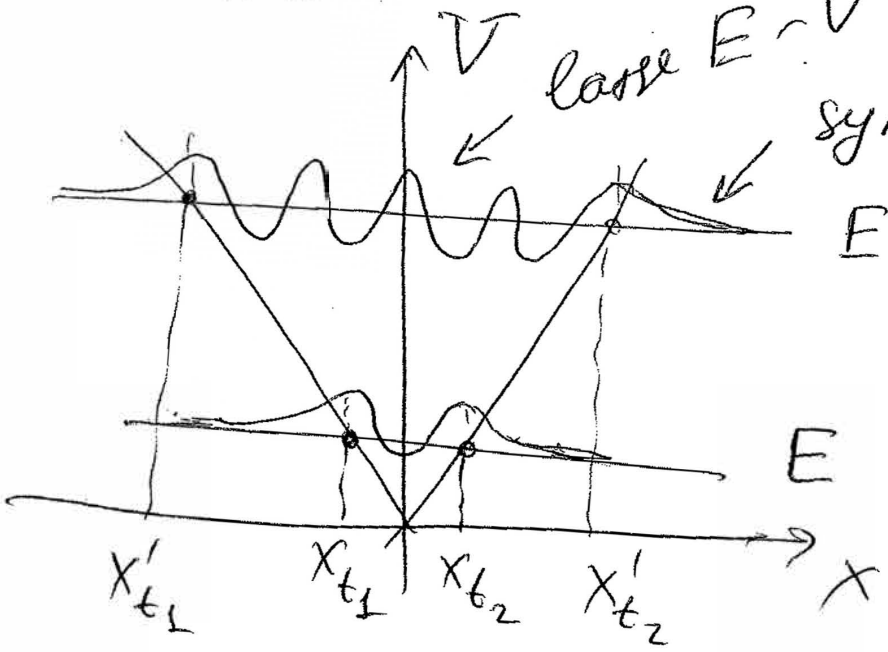
ψ(x) → 0 only @ X → ±∞

unbounded regardless of E

⇓

continuous Spectrum

(b) V(x) = |x| a



loose $E \sim V$ ⇒ high spatial freq

symmetric

decays on both sides

$\psi(x) \to 0$ @ $\pm\infty$

↑

bound state

⇓

discrete spectrum