

12. The potential energy function of a particle of mass  $m$  is  $V = cx/(x^2 + a^2)$ , where  $c$  and  $a$  are positive constants. Sketch  $V$  as a function of  $x$ . Find the position of stable equilibrium, and the period of small oscillations about it. Given that the particle starts from this point with velocity  $v$ , find the ranges of values of  $v$  for which it (a) oscillates, (b) escapes to  $-\infty$ , and (c) escapes to  $+\infty$ .