11. Suppose a particle in 1d is subjected to a potential $a/\cos^2(x/X)$. Using action-angle variables,

    (a) set up an expression for J, but do not do the integral. For what E's is it possible to use action angle variables? Sketch the potential near the origin.

    (b) Look at the case of small oscillations, $x \ll X$. Get the frequency by elementary means.

    (c) Do the integral for dJ/dE for the case of small oscillations, and compare to the answer in (b). You may need the integral

$$\int \frac{dx}{(u^2 - x^2)^{1/2}} = \sin^{-1}(x/u)$$