[mex265] Logarithmic central-force potential

Consider a particle of mass m moving under the infuence of a central-force potential $V(r) = \kappa \ln(r/r_0)$, where κ is a reference energy and r_0 a reference radius.

- (a) Find the radius r_c of a circular orbit with angular momentum ℓ .
- (b) Show that this circular orbit is stable (in the sense that small perturbations remain small).
- (c) Find the kinetic energy T_c (in units of κ) of the particle in this circular orbit.
- (d) Find the period τ_c (as a function of ℓ and κ) of this circular orbit.
- Now the particle is stopped and released from rest at radius r_c .
- (e) Find the radius r_s (in units of r_c) at which it will have regained its kinetic energy T_c ?

Solution: