[mex53] Stability of circular orbits

Consider a particle of mass m and angular momentum ℓ subject to a central force $F(r) = -V'(r)$.
(a) Show that the condition for the existence of a circular orbit at radius R is $F(R) + \ell^2/mR^3 = 0$.
(b) Show that the stability condition of this circular orbit is $F'(R) + (3/R)F(R) < 0$.

Solution: