J06E.3 - Harmonic Oscillator Radiation

Problem

A classical particle of mass m and charge q moves in an isotropic three-dimensional harmonic potential with "spring constant" K such that its trajectory is nearly circular at all times.

a) What is the characteristic time (time constant) for the decay of the kinetic energy of this system due to electromagnetic radiation?

b) What condition(s) must be satisfied so that the fraction of the energy radiated per period of the motion is small (i.e. so that the the quality factor of this oscillator remains high), and hence the trajectory is indeed nearly circular?

c) Verify that this requirement implies that the radiation-reaction force is small compared to the spring force on the particle.