

(1) Would an electron exposed only to solar radiation pressure and gravity be expelled from the solar system?

The gravitational force on an electron is Gm_eM_\odot/r^2 . The force due to radiation pressure is $\sigma_t \langle s \rangle / c$; s is the energy flux $= L_\odot / 4\pi r^2$; and σ_t is the Thomson scattering cross section of the electron: $\sigma_t = 8\pi/3(e^2/mc^2)^2$. There is no factor of 2 in the radiation pressure force because the differential cross section is symmetric between forward and backward hemispheres. Numerically, the ratio of gravitational to radiation pressure forces is about 40, so the electron will stay in the solar system.