ZBL#147.pages

Clarification is wanted for two aspects of the orbits of moons around planets.

1) Tidal forces are said to cause moons rotating outside the synchronous distance to recede away from the planet, while closer moons lose altitude and approach the planet. The synchronous distance is that at which a moon rotating above the equator in the direction of its rotation would appear stationary (as with Earth's geosynchronous communications satellites).

The catcher should locate and describe formulas for the rates of recession or approach, and use these formulas to calculate the current rates of recession and approach of the two small moons of Mars, Deimos and Phobos (Deimos has an orbital period of 30.3 hours, Phobos 7.6 hours [http://en.wikipedia.org/wiki/Moons_of_Mars], while Mars itself rotates in 24.63 hours). For background, the Moon has been calculated to be slowly receding from Earth at the rate of approximately 38 millimetres per year

2) What forces act to bring a moon's orbit around its primary to conform with the planet's own rotation, that is, are moons not orbiting strictly in the planet's equatorial plane moved towards conforming? Are there formulas to calculate this? As background, Saturn's main rings orbit strictly in its equatorial plane, while the outer Phoebe ring is tilted at 26.7 degrees to this plane. Phoebe and its ring also have retrograde orbits, rotating in the opposite direction to the larger moons and the rings. Do the formulas in (1) still apply for a moon in a retrograde orbit, in particular for Neptune's large moon Triton [http://en.wikipedia.org/wiki/Triton_(moon)#Orbit_and_rotation]?