

Astro 118 – Physics of Planetary Systems
Final Exam *Practice Questions*, Winter 2012

- 1) As seen from Earth, why can the geometric albedo not be measured for an exoplanet on an inclined orbit?
- 2) Which time is longer---the orbital period of $1 M_J$ planet at 0.02 AU around a Sun-like star, or the maximum possible transit duration of a $1 M_J$ planet at 5 AU around that same star?
- 3) When Io passes between Jupiter and the Sun, one hemisphere of Io is fully illuminated by the Sun, and one hemisphere is fully illuminated by light reflected off of Jupiter. Assuming the “slow rotation” case with no energy transport from one hemisphere to the other, what is the night-side temperature on Io, due only to absorbing light reflected off of Jupiter? Io’s Bond albedo is 0.4, Jupiter’s geometric albedo in a wide visible bandpass is 0.5, and Io orbits at 420,000 km from Jupiter. Jupiter’s radius is 70,000 km. Ignore any complicated geometric effects regarding how much of Jupiter’s actual surface you can see from such a close-in distance. Io has no atmosphere.
- 4) For the Sun, Earth, Moon system, determine: The orbital period ratio between two stable (but hypothetical) Moon orbits. One is at the farthest distance at which the Moon can orbit the Earth, and the other is the closest-in that the Moon can orbit the Earth, without breaking up. Assume that the moon is a rigid (not fluid) body held together by gravity.