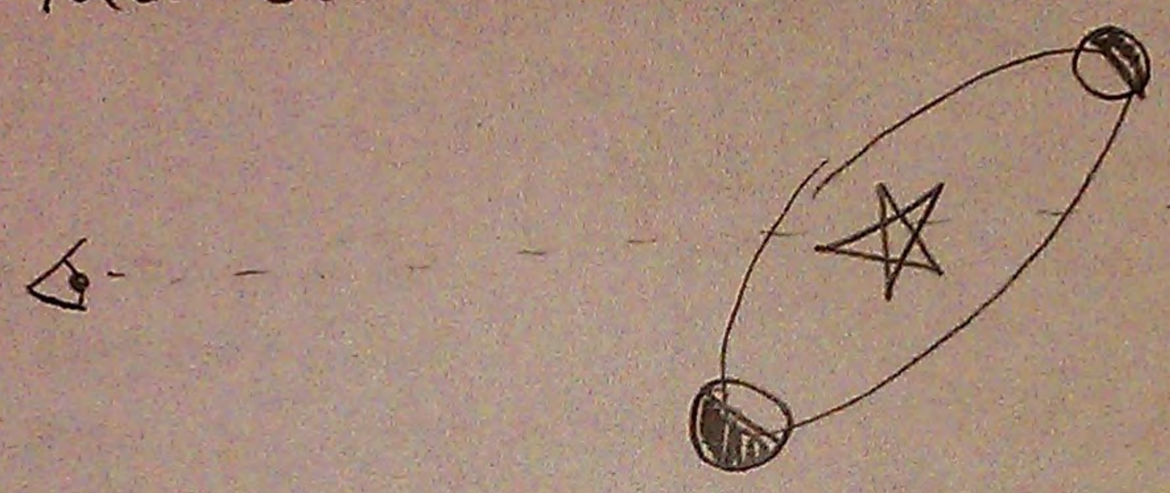
PRACTICE EXAM
WINTER 2012
ASTRO 118

1) THE GEOMETRIC ALBEDO CAN ONLY BE MEASURED IF YOU ARE VIEWING THE PLANET AT "FULL PHASE," MEANING FULL ILLUMINATION. IF THE EXOPLANET'S ORBIT IS INCLINED RELATIVE TO EARTH, WE WILL NEVER SEE A FULLY ILLUMINATED PLANET



2) THE TWO EQUATIONS TO USE ARE NEWTON'S VERSION OF KEPLER'S THIRD LAW: $p^2 = \frac{4\pi^2}{G(M_* + M_p)} a^3$ ← IGNORE — ORBITAL PERIOD

AND TRANSIT DURATION: IF $i = 90°$ (MAXIMUM DURATION — CROSS THE FAT MIDDLE OF THE STAR)

GET FROM KEPLER'S LAW

EQ. (4.33) $\tau = \frac{P}{\pi} \sin^{-1}\left[\frac{1R_\odot}{a}\left[\frac{(1 + \frac{R_p}{R_*})^2 - 0}{1}\right]^{1/2}\right]$ ($1R_\odot$, $1R_J$)

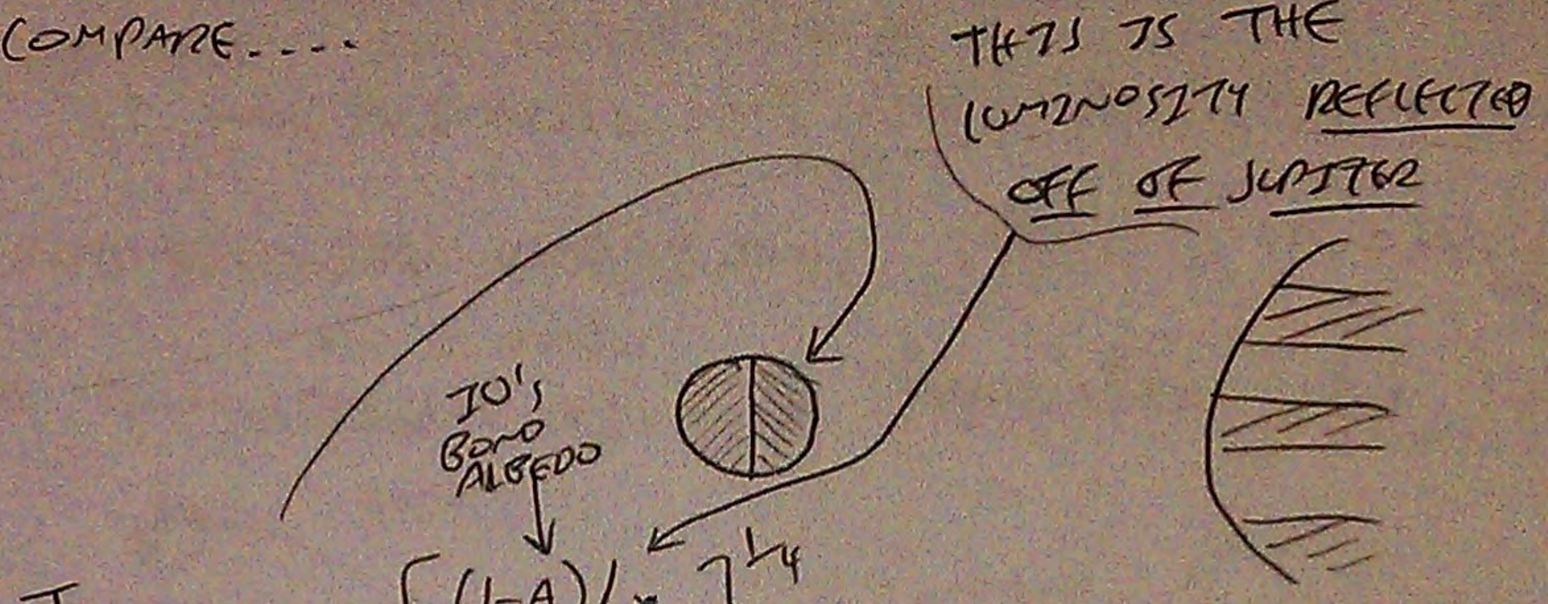
5 AU $1R_\odot$

WORKS IN SI or CGS UNITS

2) CONTINUED...

SO, THEN JUST PLUG IN ALL OF THE NUMBERS AND COMPARE....

3)



EQ. 6.10) $f_{REFLECTED\ OFF\ OF\ JUPITER} = \frac{1}{4\pi d_{IO}^2} \cdot 0.5 \cdot A_J \pi R_J^2 \frac{L_*}{4\pi d_{JUPITER}^2}$

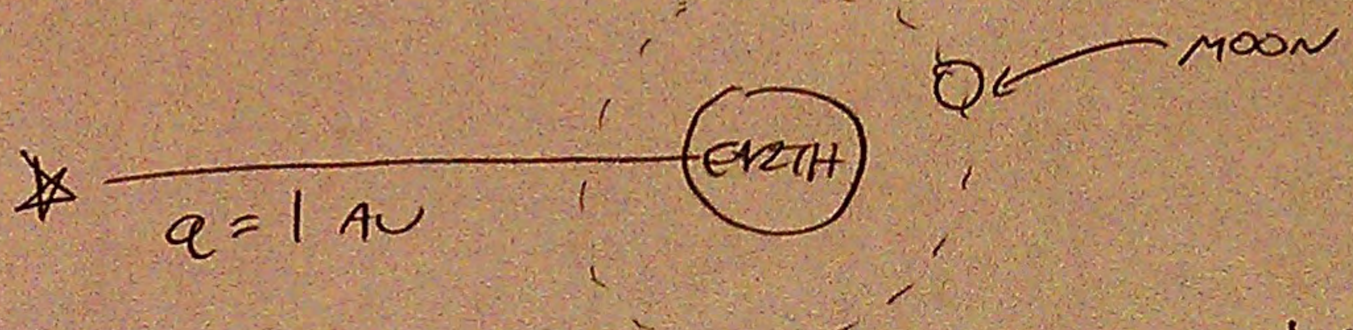
DISTANCE FROM SUN TO JUPITER = 5.2 AU

DISTANCE TO IO, WHICH IS OUR OBSERVER

$$T_{P,HEMIS} = \left[\frac{(1-A_B)}{2\sigma}\left(\frac{L_*}{4\pi d_{IO}^2}\right)\right]^{1/4} = \left[\frac{(1-A_B)}{2\sigma} \cdot 0.4 \cdot f_{REFLECTED}\right]^{1/4}$$

L_* HERE IS THE REFLECTED LUMINOSITY OF JUPITER, AND THE $/4\pi d^2$ GIVES THE FLUX HITTING OUR OBSERVER, IO.

4)



FARTHEST DISTANCE: HILL SPHERE $\longrightarrow$ $R_H = a\left(\frac{M_\oplus}{3M_\odot}\right)^{1/3}$ (1 AU)

CLOSEST DISTANCE: ROCH RADIUS $\longrightarrow$

FOR A RIGID (NON-FLUID) BODY

$d_{ROCHE} = R_\oplus \left(2\frac{\rho_\odot}{\rho_{moon}}\right)^{1/3}$

I DON'T HAVE MY NOTES WITH ME, SO THIS NUMERICAL FACTOR MAY BE WRONG

I SHOULD HAVE GIVEN YOU R_{MOON} AND M_{MOON} FOR THIS PROBLEM!