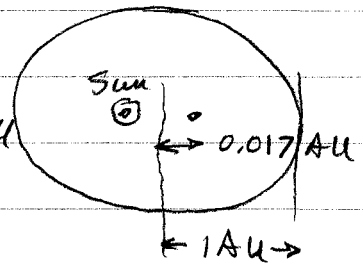
Homework 3 Ast 207 28 Sept 09

1. From fig, $D_{greatest} = 1.017\,AU$
$D_{smallest} = 1 - 0.017 = 0.973\,AU$



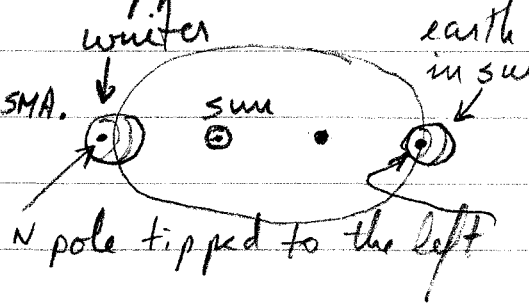
2. a&b) Summer is when the North pole is tipped toward the sun; during winter, it is tipped away from the sun. To make winter short, the earth must move more quickly during winter. According to K's 2nd law, the earth must be closer to the sun for that to happen.

Horizontally exaggerated.

3. 2b) K's 3rd law: $P^2 = A^3$. Solve to get the SMA.

$A = P^{2/3} = 76^{2/3} = 17.9\,AU.$

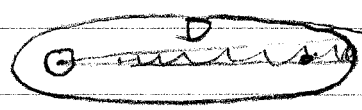
as in problem #1, the dist from the center of the orbit to the sun is $\varepsilon A = 0.967 \times 17.9\,AU.$



$D_{greatest} = 17.9 + 0.967 \times 17.9 = 35\,AU$

$D_{smallest} = 17.9(1 - 0.967) = 0.59\,AU$

c) K's law of equal areas says "Area swept out is the same." The area is $\frac{1}{2} D \cdot v \cdot t$, where v is speed and t is time.



$D_g v_g t = D_s v_s t \Rightarrow \frac{v_s}{v_g} = \frac{D_g}{D_s} = \frac{35\,AU}{.59\,AU} = 60.$

4. a) Orbit is smaller because the period is smaller. Use K's 3rd law.

b) Use $P^2 = A^3$. $A = P^{2/3} = 0.047\,AU.$