

Astr 1010
Problem Set #4 (Turn in— by 9/19/02)

1. Consider an observer who lives at 18° North latitude. At noon, what angle does the sun make with the Southern horizon on:

a) Sept 21 b) Dec 21 c) Mar 21 d) June 21 Does the sun rise and set for every day of the year? Will the sun ever be directly overhead during the year, at this latitude?

2. Repeat all parts of Problem #1 for an observer who lives at 72° N latitude.

3. a) The planet Uranus has a diameter of 51,120 km. When it is at a distance of 2.8×10^{12} m, what is its angular width, as seen from the earth? (Express the answer in arcseconds.)

b) Uranus has a small moon called Oberon which is about 1520 km in diameter. If it is at the same distance from us as given in part (a), what is its angular size as seen from the Earth?

4. a) The AU (“Astronomical Unit”) is the average distance of the earth from the sun; $1 \text{ AU} = 1.50 \times 10^{11} \text{ m}$. If the distance from Uranus to the Earth is $2.8 \times 10^{12} \text{ m}$, what is its distance in AU’s?

b) At this distance, how long would it take a radio (light) signal sent from Uranus to reach the earth?

$$1 \text{ km} = 1000 \text{ m} \quad d = vt \quad c = 2.998 \times 10^8 \frac{\text{m}}{\text{s}} \quad 1 \text{ AU} = 1.50 \times 10^{11} \text{ m}$$

$$\theta = \frac{d}{D} \quad \text{when } \theta \text{ is in radians; } d \text{ and } D \text{ need to have the same units!}$$

$$1 \text{ deg} = 60 \text{ (arc)minutes} \quad 1 \text{ (arc)minute} = 60 \text{ (arc)second} \quad \pi \text{ rad} = 180 \text{ deg}$$