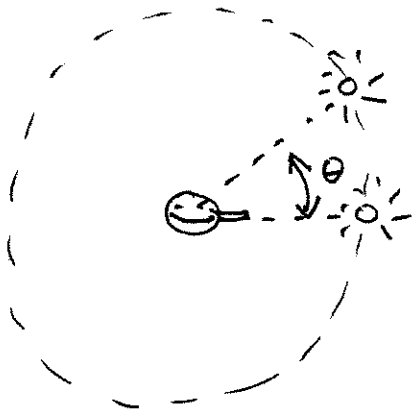


## Homework 2

### Problem 1

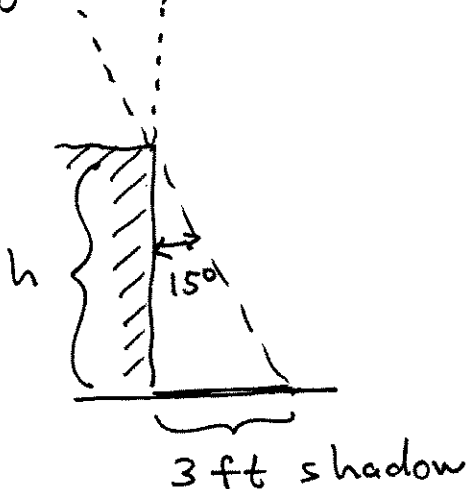
During 24 hours, the sun rotates  $360^\circ$  around earth; during 1 hour



$$\frac{\theta}{360^\circ} = \frac{1 \text{ hr}}{24 \text{ hr}}$$

$$\Rightarrow \theta = 15^\circ$$

$\Rightarrow$  angle at which sun's rays hit earth changes by  $15^\circ$ .



$$\frac{3 \text{ ft}}{h} = \tan \theta = 0.268$$

$$h = 11.2 \text{ ft}$$

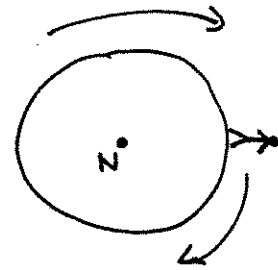
### Problem 2

~~Over the year~~ The stars rise and set in the same place night after night throughout the year. The sun rises and sets in different places on the horizon throughout the year.

### Problem 3

The earth rotates once per 24 hours, so a person on the equator moves a distance equal to the circumference of the earth in 24 hours:

$$\begin{aligned} \text{speed} &= \frac{\text{circumph}}{24 \text{ hours}} \\ &= \frac{25,000 \text{ mi}}{24 \text{ hr}} \\ &\approx 1,000 \text{ mi/hr} \end{aligned}$$

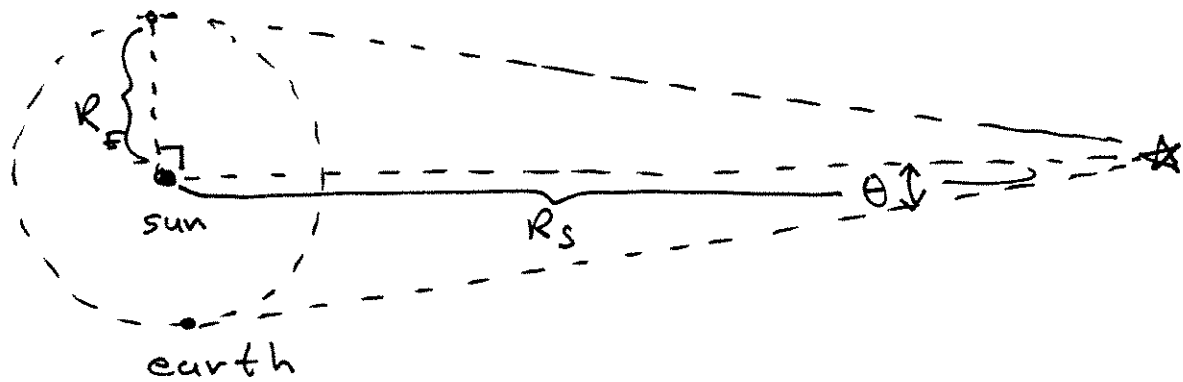


A galloping horse goes about 40 mi/hr (I am guessing) so this is very fast!

This probably would make a contemporary of Copernicus nervous. They might argue any of the following:

- We would "feel" this motion
- We would be thrown from the earth if we are going around a circle this fast (as we would be thrown from a rapidly rotating carousel)

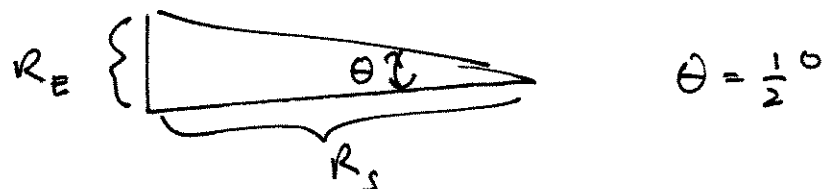
## Problem 4



Position of star in sky differs by angle  $\theta$

$R_E$  = radius of earth orbit

$R_S$  = distance from sun to star

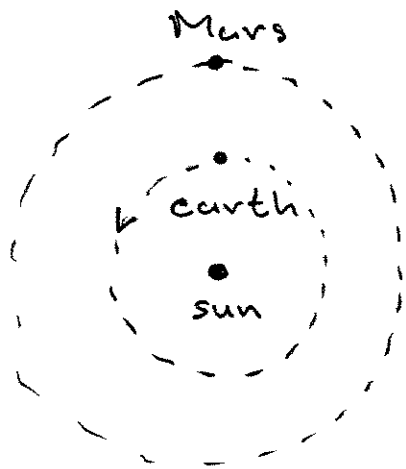


$$\frac{R_E}{R_S} = \tan \frac{1}{2}^\circ = 0.0087$$

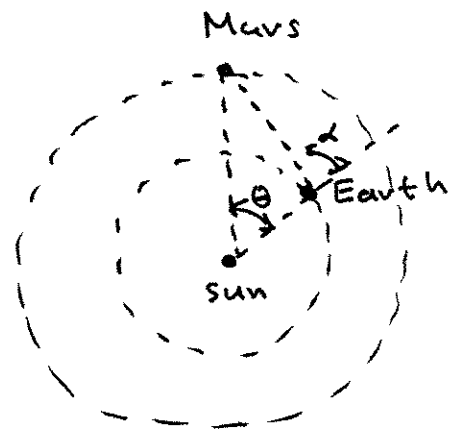
$$\Rightarrow R_S = \frac{R_E}{0.0087} = 115 R_E$$

The stars must be at least this far away in order to make stellar parallax unobservable.

## Problem 5



687 days  
later



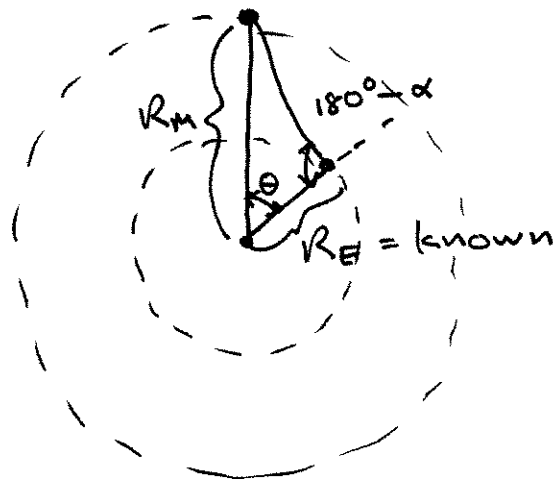
"in opposition"

Note 687 days = 2 yr - 43 days

$$\frac{\theta}{360^\circ} = \frac{43 \text{ days}}{365 \text{ days}} \Rightarrow \theta \approx 42^\circ$$

$\alpha$  = angle of Mars from "straight up"  
= measured

$\Rightarrow$  we know 2 angles and one side of  
a triangle:



$\Rightarrow$  can find  $R_M$